



Polaroid

Repair Manual



MP4/MP4+ Multipurpose Camera System

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Description	<i>Polaroid MP4/MP4 Plus</i>
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SECTION 1

DESCRIPTION

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Description	<i>Polaroid MP4/MP4 Plus</i>
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A. INTRODUCTION

The Polaroid Land Multipurpose MP-4 and MP4+ Camera Systems (Figures 1-1 and 1-2) re-designed for photographing drawings, line and halftone artwork, photographs and objects of limited size.

The Systems are extremely versatile and have many uses in industry, business, medicine, science, education, graphic arts, etc.; Applications include copying, small-object photography, photomicrography, photomacrography, gross specimen photography and X-ray film copying.

MP-4 and MP4+ Systems can be used with almost all Polaroid instant color and B&W sheet, pack and roll films, as well as some wet-process films. With instant films, most jobs can be completed within seconds, without a darkroom.

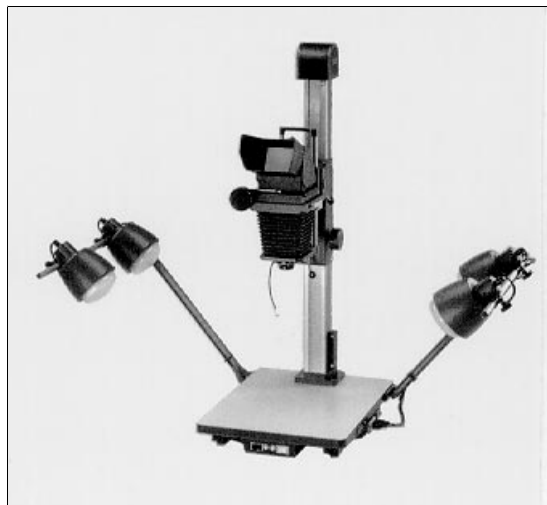


Figure 1-1 MP4 System with standard 35" (90cm) column and sliding camera head.

A choice of lenses, a macro extension and two column heights make possible a wide range of reproduction ratios, from extreme reduction to high magnification. When used with a microscope, even higher magnification is obtained.

The numerous options and accessories, described on the following pages, make the MP-4 and MP4+ complete photographic systems, limited only by the user's imagination.

The basic elements of any system are a **CAMERA HEAD**, carriage-mounted on a **VERTICAL COLUMN** attached to a **BASEBOARD**, and a **LIGHTING SYSTEM** to illuminate the subject.



Figure 1-2 MP4+ XLR System with 55" (140cm) rotating column & baseboard well.

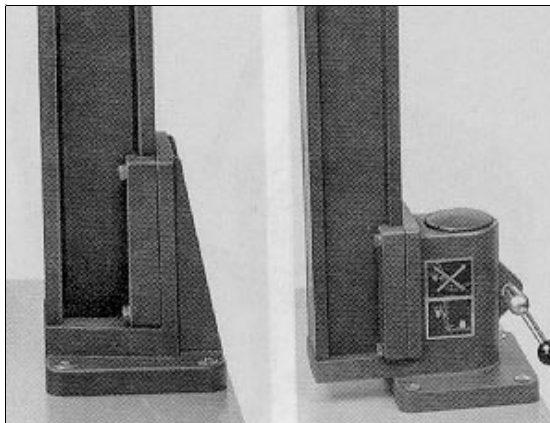
The camera may be either a **fixed head** type such as the 8x10 camera shown under Options and Accessories, or a **sliding head** type as shown in Figure 1-3. With a fixed head, the film holder must be removed from the head before framing and focusing the picture.

With the sliding head (see Figure 1-3), a ground glass screen and an optional reflex viewer (a) are mounted on the left end of the head, and the film holder (j) is in the right end of the sliding head. This allows focusing and viewing the subject while the film and film holder remain in place in the head. When the head is moved into the viewing/focusing position shown, a "preview" cable release opens the shutter (d). Then sliding the head to the left closes the shutter and brings the film holder into the picture-taking position, over the camera body (c). To take the picture, the shutter is operated with the "exposure" cable release (f), to expose the film.



Figure 1-3 Sliding camera head in viewing/focusing position (film holder is inside the right end of head)

The **vertical column** allows positioning the camera head for the desired reproduction size. Two column heights are available: STD 35" and XL 55" (90cm and 140cm) (see Figures 1-1 and 1-2). In addition, a rotatable column (Model XLR) is available (at right in Figure 1-4), permitting the camera head to be aimed at the floor rather than the baseboard. This can be useful for photographing subjects not easily placed on the system baseboard.



**Figure 1-4 Non-Rotatable Column (left)
Rotatable Column (right)**

CAUTION:

Before rotating column, place adequate weight on baseboard to prevent camera from falling over.

If baseboard has lightbox, replace glass cover with baseboard insert.

NEVER PLACE HEAVY OBJECTS ON GLASS COVER.

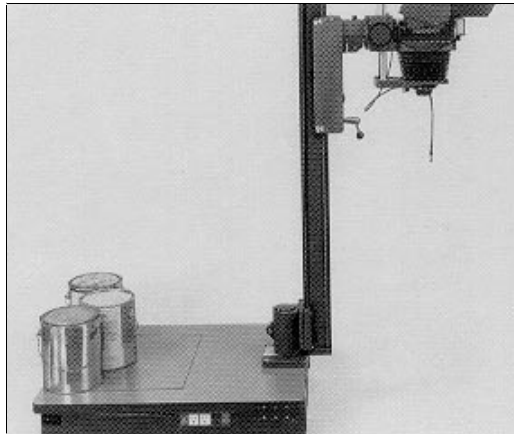


Figure 1-5 Counterbalancing weight of camera head when column is rotated.

The third basic element of the System is the **baseboard**, on which the item to be photographed is placed and which supports the vertical column and the lighting system arm. The baseboard also houses the wiring, switches and receptacles for the lighting system and powered accessories.

Older MP-4 Systems have white-surfaced baseboards and separately-supplied lighting wiring harnesses.

Newer MP4+ Systems have baseboards with the following features: an 18% gray surface to reduce reflections and permit pre-metering exposures; built-in drawer to hold operating instructions and lenses (Figure 1-6); leveling feet at four corners; built-in wiring harness for lighting and accessories; and on XLR models, a well to accept the optional subilluminating light box (see Figure 1-2 and Options and Accessories sections).



Figure 1-6 Storage drawer in MP4+ System baseboards

Description	<i>Polaroid MP4/MP4 Plus</i>
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The last basic system element, the **lighting system**, may be selected from three optional choices: tungsten (Figure 1-2), quartz halogen or high-intensity fiberoptic. Tungsten and halogen lamps are usually mounted on the lighting arms, but may be used on separate light stands. Lamp holder mounting brackets are threaded to accept standard tripod screws.

(All lighting systems are shown in the System Options and Accessories section.)

In addition, for MP4+ XLR Systems only, an optional subillumination Light Box is also available. This unit drops into a well in the XLR baseboard (cover is removable), and is particularly useful when photographing transparent and translucent subjects. It may also be used in combination with other light sources to eliminate shadows around solid objects.

B. DIFFERENCES AMONG MODELS

The key characteristics of the five different MP-4 and MP4+ Systems are summarized in the chart on the next page. For additional descriptive information, part numbers, etc., please refer to other sections of this manual, the latest MP-4/MP4+ Parts Catalog and MP4+ sales literature.

In addition to the unique features listed, all **MP4+ Systems** have **black anodized columns** to eliminate reflections on shiny subjects; **cable release hold-downs** to minimize wear and breakage; and a **longer locking/release knob lever** which allows full rotation of the camera head.

Description	<i>Polaroid MP4/MP4 Plus</i>				
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KEY CHARACTERISTICS - MP-4/MP4+ MULTIPURPOSE CAMERA SYSTEMS

	MP-4 STD	MP-4 XL	MP-4 XLR	MP4+STD	MP4+XLR
Total Camera Height	46" (116cm)	66" (168cm)	66" (168cm)	46" (116cm)	66" (168cm)
Column Height	35" (90cm)	55" (140cm)	55" (140cm)	35" (90cm)	55" (140cm)
Column Rotates	No	No	Yes	No	Yes
Column finish	Bright	Bright	Bright	Black	Black
Baseboard: Size	18x23" (46x59cm)	23x29" (59x74cm)	23x29" (59x74cm)	18x23" (46x59cm)	23x29" (59x74cm)
Wiring harness supplied attached	No	No	No	Yes	Yes
Baseboard Color	White	White	White	18% Gray	18% Gray
Well for Light Box	No	No	No	No	Yes
Leveling feet	No	No	No	Yes	Yes
Digital Timer		Optional Accessory		Included	
Camera Heads: (All systems)					
		Fixed	4440 4444		
		Sliding	4441		
Film Holders: (All systems)					
		4x5" sheet	#545		
		4x5" pack	#550		
		3-1/4x4-1/4" pack	#4447 #4448		
		roll	#4446		

Description	<i>Polaroid MP4/MP4 Plus</i>
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C. SYSTEM OPTIONS AND ACCESSORIES

The following items may be used with any MP-4 or MP4+ System unless noted otherwise. Further details can be found in Polaroid sales literature and operator instruction manuals.

SLIDING CAMERA HEAD (Figure 1-7) allows previewing and focusing without removing film holder (see Figure 1-3). Sliding the head from the previewing to the picture-taking position automatically closes the shutter.

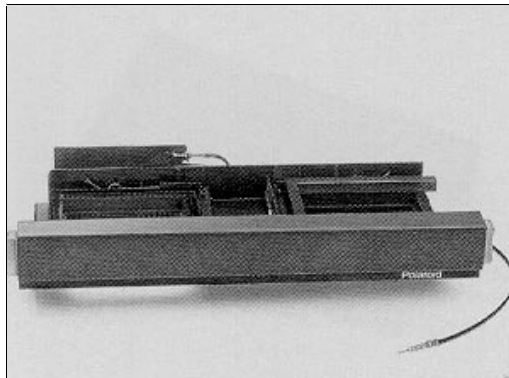


Figure 1-7 Sliding Camera Head Model 4441

FIXED CAMERA HEAD (not illustrated) holds ground glass screen and film holder at top of camera body and bellows assembly. Film holder must be removed to view and focus the subject.

8X10 CAMERA (Figure 1-8) attaches to column in place of standard MP-4 camera, accepts Polaroid instance 8x10 films.



Figure 1-8 TTI AV/810 8x10 Camera

8x10 FILM HOLDER & FILM PROCESSOR (Figure 1-9) for exposing and conveniently processing Polaroid 8x10 films. Holder also usable with other 8x10 cameras.

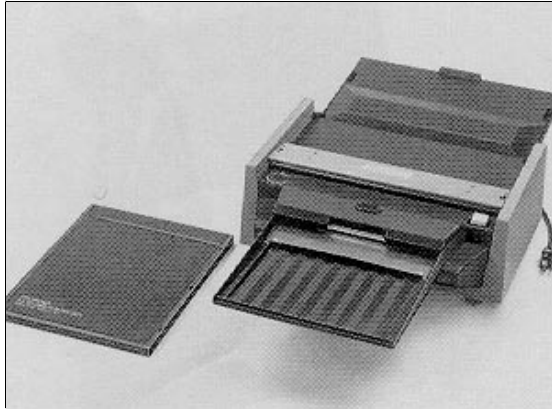


Figure 1-9 Polaroid 8x10 Film Holder & Film Processor

REFLEX VIEWER (Figure 1-10) attaches to ground glass and directs image forward, excluding ambient light, for easier focusing and viewing.

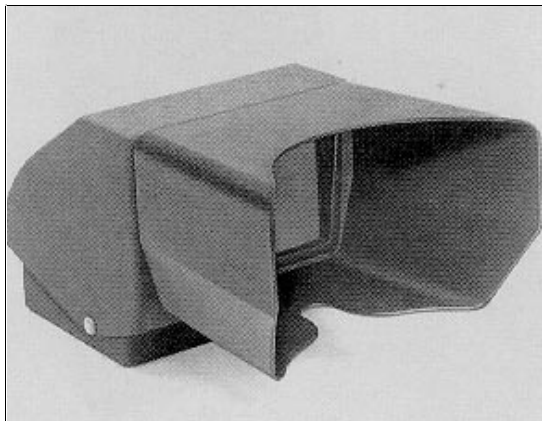


Figure 1-10 Reflex Viewer

GROUND GLASS FOCUSING SCREENS (Figure 1-11) are for use with Polaroid (and many wet-process) film holders. They are scribed for Polaroid 4x5 sheet and 3-1/4x4-1/4 pack films. Three types: standard for general-purpose use, aerial image type with clear center circle, and calibrated type (inches and centimeters) for measuring repro size.

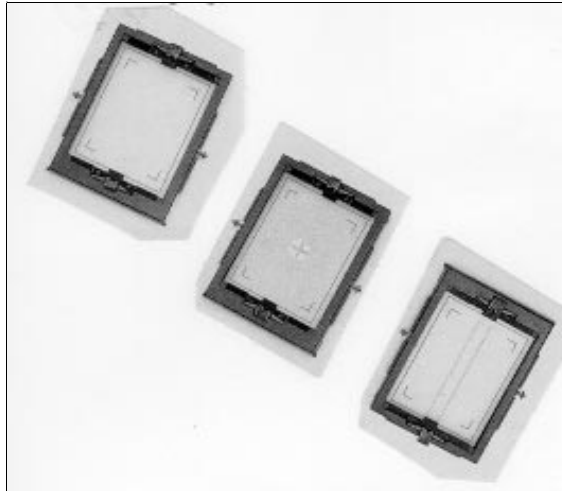


Figure 1-11 Standard, aerial image & calibrated ground glass focusing screens

FILM HOLDERS shown (Figure 1-12) include types for Polaroid instant 4x5 sheet film (Model 545), 4x5 pack films (Model 550), and 3-1/4x4-1/4 pack films (Models 4448 and 405). Several wet-process roll and sheet film holders may also be used with MP-4 and MP4+ Systems.

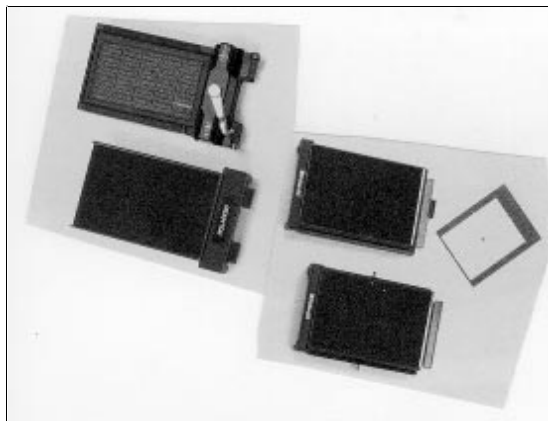


Figure 1-12 Polaroid instant pack and sheet film holders

SHUTTER KIT (Figure 1-13) includes a self-cocking, lensless shutter with 1 sec. to 125th sec. speeds, B and X-sync; cable release; and microscope adapter for microphotography.

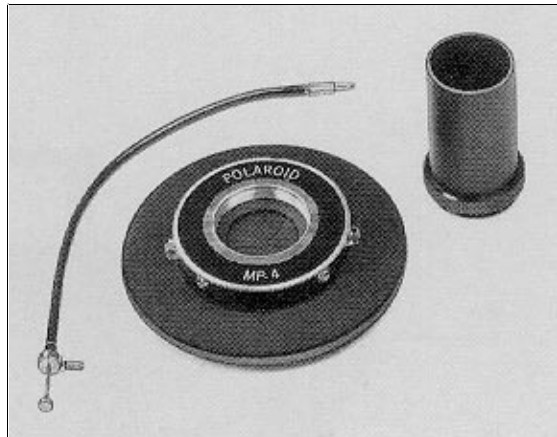


Figure 1-13 Shutter Kit



Figure 1-14 135mm to 17mm lenses

LENSES (Figure 1-14) mount on the Shutter described above and include focal lengths of 135, 1015, 75, 50, 35 and 17mm. All are f/4.5 to f/32 except 17mm, which is f/4 to f/22.

FILTER KIT (Figure 1-15) includes gelatin filters for balancing tungsten and quartz halogen lighting to Polaroid Polacolor films, filter holder, two trays, filter frame and complete instructions. Also permits use of other filters.

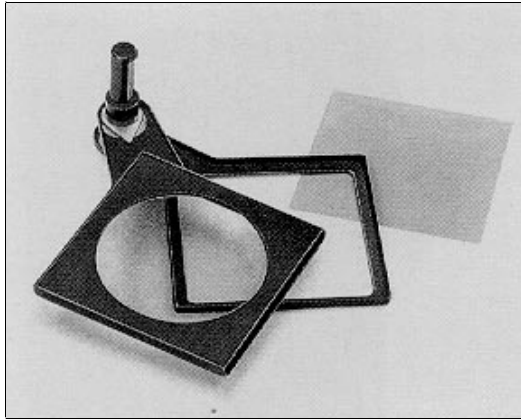


Figure 1-15 Filter Kit for Polacolor films

MACRO EXTENSION (Figure 1-16) mounts between bellows and camera head. Permits magnifications up to about 27X with 17mm lens. Two Extensions may be used for higher magnification.

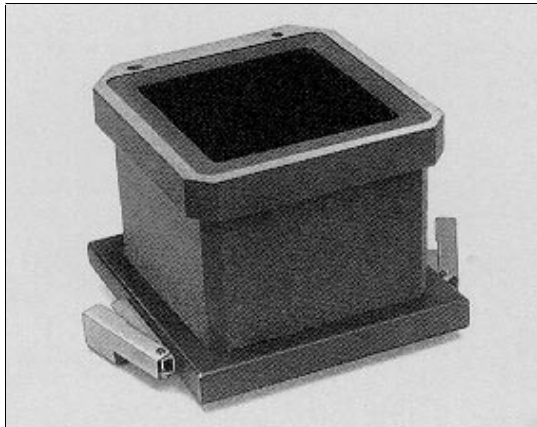


Figure 1-16 Macro Extension for 17mm lens

TUNGSTEN LIGHTING SYSTEM (Figure 1-17) for general-purpose photography includes four 150 watt lamps and lamp holders (110-120V or 220-240V). Attach to Lighting Arms (supplied separately) or light stands.

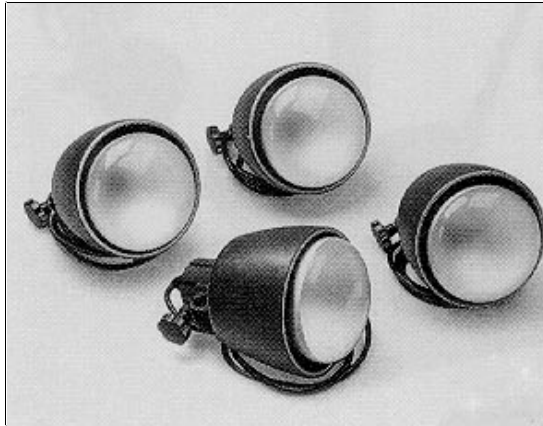


Figure 1-17 Tungsten Lighting System

QUARTZ HALOGEN LIGHTING SYSTEM (Figure 1-18) maintains color temperature for life of lamp. Two lamp heads with lamps; 110V systems include diffusing and protective screens, 220V systems include barn doors and protective screens. Heads attach to Lighting Arms or light stands.

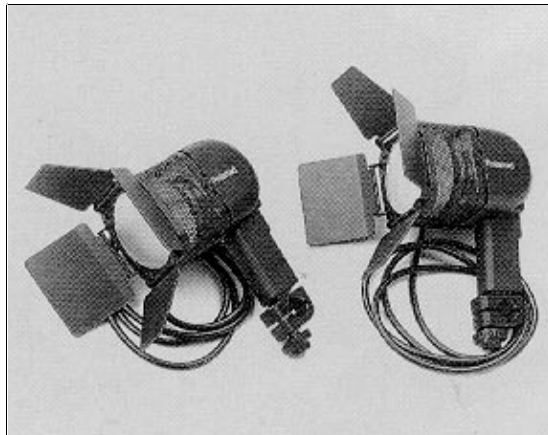


Figure 1-18 Quartz Halogen Lighting System

FIBER OPTIC LIGHTING SYSTEM (Figure 1-19) made by Dolan-Jenner provides intense, focused lighting for high-magnification photography of small objects. Light output intensity is adjustable. Includes power supply, quartz halogen light source, two fiber optic bundles, two lens/filter adapters, lenses and filters.

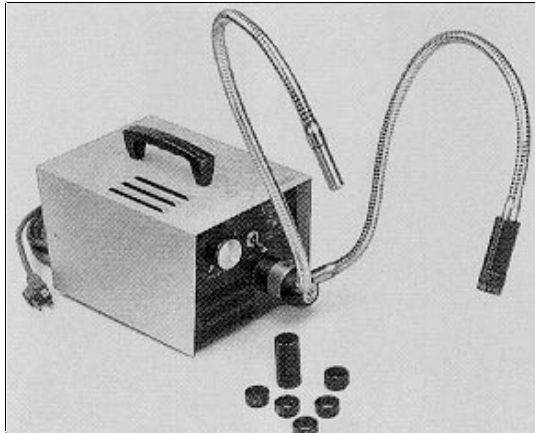


Figure 1-19 Fiber Optic Lighting

BASEBOARD SUB-ILLUMINATION LIGHT BOX (Figure 1-20) drops into baseboard well in MP4+XLR System. Four 14-watt fluorescent lamps evenly illuminate 11" x 14" (43 x 55cm) area. Ideal for transparent or translucent subjects, or shadowless background lighting in conjunction with reflective lighting.

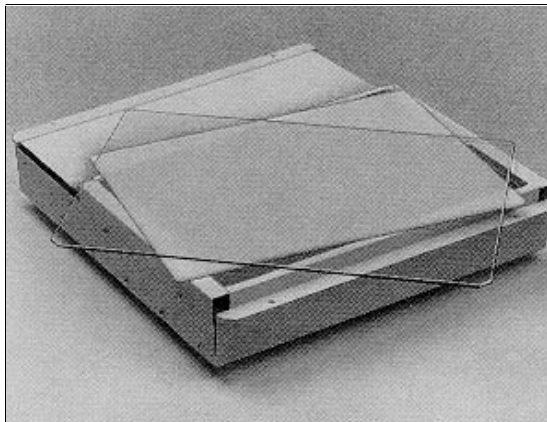


Figure 1-20 Light Box for MP4+XLR

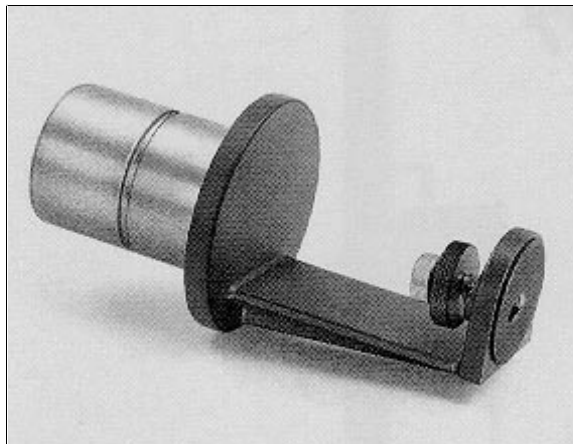
FILM PROCESSING TIMER (Figure 1-21) allows convenient, accurate timing of film development. Beeps when selected preset time has elapsed. Battery-operated, three-digit, adhesive backing for attaching to camera head or any convenient location. Supplied with MP4+ Systems and also available as an accessory.



Figure 1-21 Film Processing Timer

CONDENSER ENLARGING HEAD (not shown) replaces camera head for use of the System as an enlarger. Accepts negative carriers from 35mm to 4x5.

UNIVERSAL CAMERA MOUNT (Figure 1-22) allows the MP-4/4+ System to be converted to a 35mm copying or slidemaking system. Attaches to System column in place of camera head.



**Figure 1-22 Universal Camera Mount
for other cameras**

TRIPOD ADAPTER (not shown) permits using the MP-4/4+ Camera on a tripod or studio stand, as a studio camera for portraits, large-scale copying and other uses.

SECTION 2

INSTALLATION

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INTRODUCTION

This section contains instructions for assembling and installing an MP-4 Plus system.

The MP-4 Plus system should be assembled in the area where it will be used. The system should be placed on a sturdy table or counter, large enough to provide a work surface next to the baseboard. (A desk with locked storage space is ideal, to prevent unauthorized use.) The system must be located near an appropriate electrical outlet. Avoid placing the system near windows or other sources of bright light. Be sure that the lamp arms do not extend into corridors.

A. ATTACH COLUMN TO BASEBOARD

XLR MODEL

NOTE

The optional light box should be installed before attaching the column to the baseboard. See the instructions packaged with the light box.

1. Position the column post as shown in figure 2-1, with the milled section (a) pointing toward the center of the baseboard.

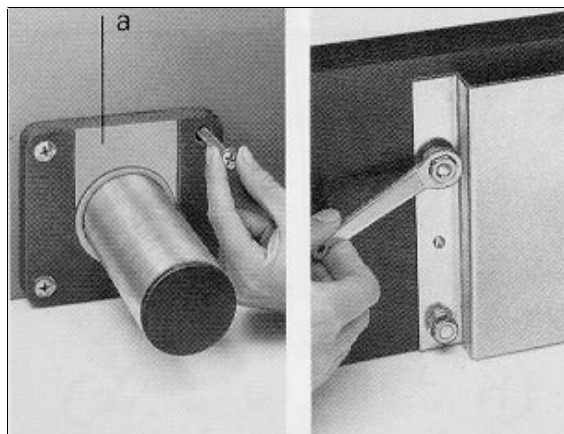


Figure 2-1. XLR Column Base

2. Fasten the post to the baseboard using the four nuts and bolts provided. A wrench is supplied for tightening the nuts. Use a suitable screwdriver to hold the bolts while you are doing this.

3. Slide the column onto the post (figure 2-2) and secure it firmly with the locking knob (b).

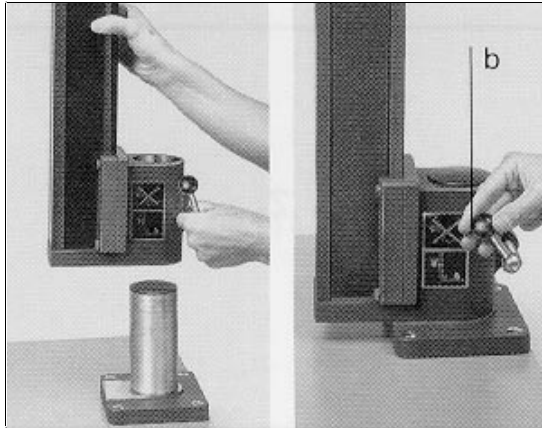


Figure 2-2. Attaching XLR Column Base

STANDARD MODEL

2. Hold the baseboard in a vertical position and the column in a horizontal position (figure 2-3). The scale on the column should face toward the center of the baseboard.

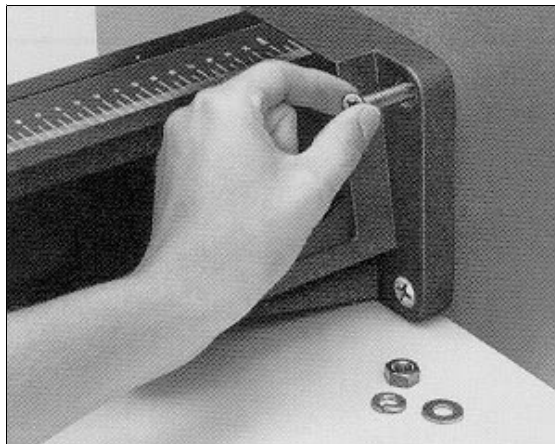


Figure 2-3. Inserting Bolts in Standard Base

2. Insert the four bolts through the column base and then through the baseboard. Add the washers and nuts.
3. Tighten the nuts with the wrench provided (figure 2-4); use a suitable screwdriver to hold the bolts while tightening them.

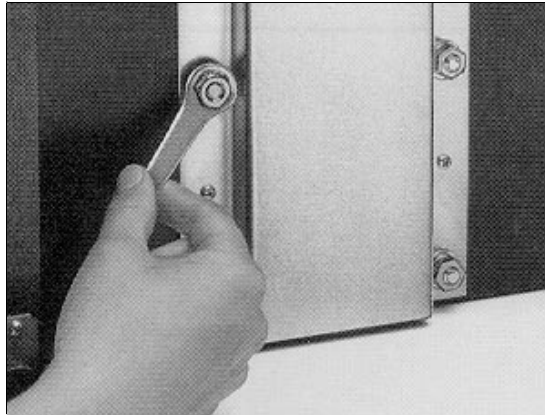


Figure 2-4. Tightening Nuts on Standard Base

B. ASSEMBLE THE CAMERA

1. Attach Vertical Carriage to Column

- a. Loosen the locking lever (c, figure 2-5) by at least one full rotation.

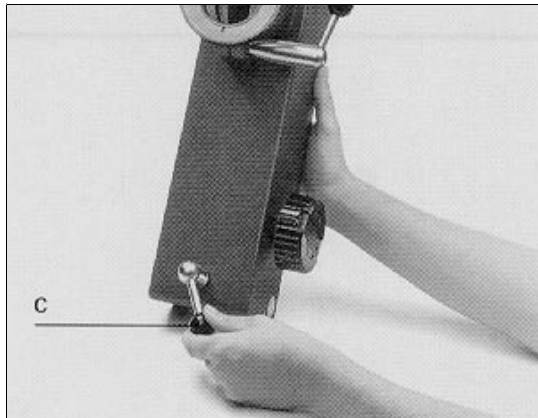


Figure 2-5. Vertical Carriage Locking Lever

- b. Carefully push lower end of the carriage onto the column, making sure that the two white rollers (d, figure 2-6) slide down behind the rails (e).

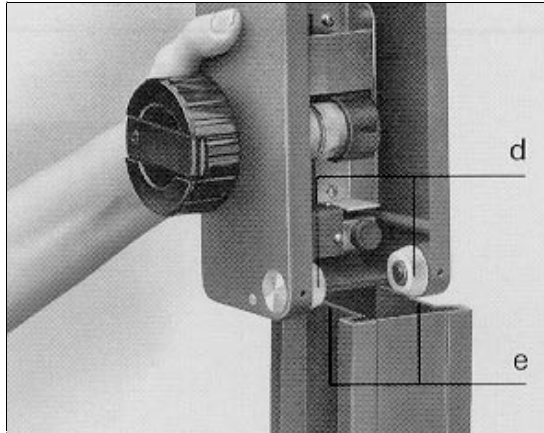


Figure 2-6. Vertical Carriage Rollers and Rails

c. Lower the carriage further, until the two white rollers at the top rest against the top of the column (figure 2-7). Slowly rotate the height adjustment lever (f) in a clockwise direction and, as the carriage slowly goes down, make sure the white rollers feed in behind the rails.

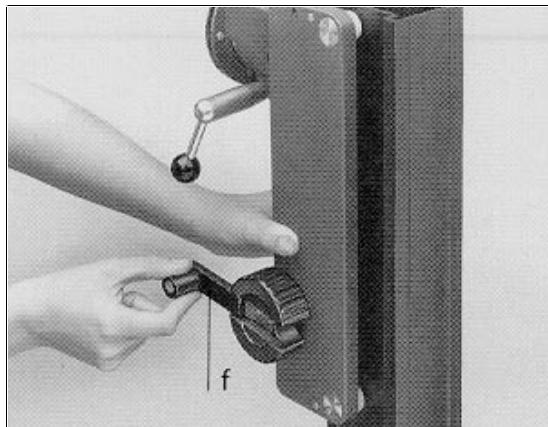


Figure 2-7. Vertical Carriage Height Adjustment Lever

d. Lower the carriage about two more inches, and lock it on the column by tightening the locking lever (c, figure 2-8).

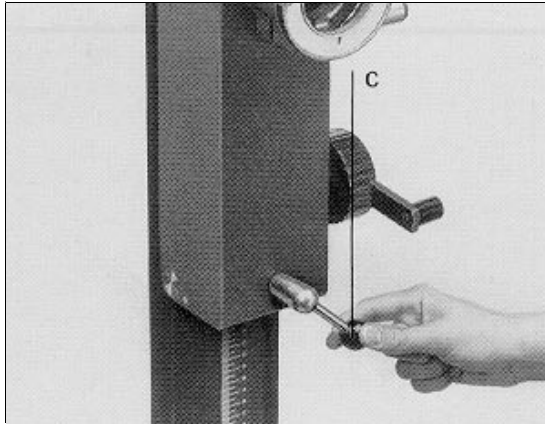


Figure 2-8. Vertical Carriage Locking Lever

2. Attach Spring Housing and Counterweight Spring

- a. Insert the spring housing into the top of the column (figure 2-9). The spring ends should face the front.
- b. Remove the pin (g, figure 2-10) from the vertical carriage by unscrewing it and pulling it out.



Figure 2-9. Orienting Counterweight Housing on Column



Figure 2-10. Removing Spring Pin

c. Unlock the vertical carriage, bring it all the way to the top of the column (figure 2-11), and lock it again.

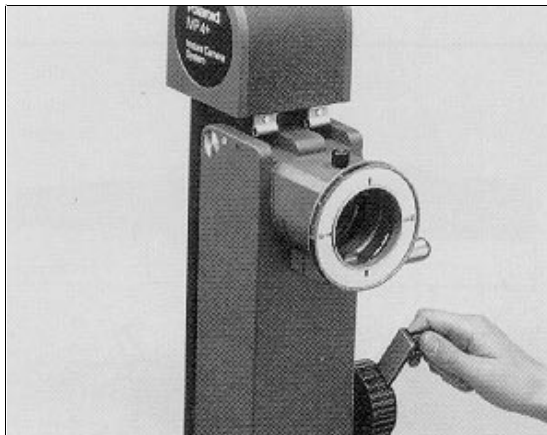


Figure 2-11. Vertical Carriage at Top of Column

d. Reinsert the pin, making sure that it goes through the loop (h, figure 2-12) in the spring end. Tighten the pin.

e. Wind vertical carriage down the column until it is at an easily accessible height (figure 2-13), then lock it in position.

WARNING

Never loosen or remove the spring pin unless the vertical carriage is at the top of the column and locked in position.

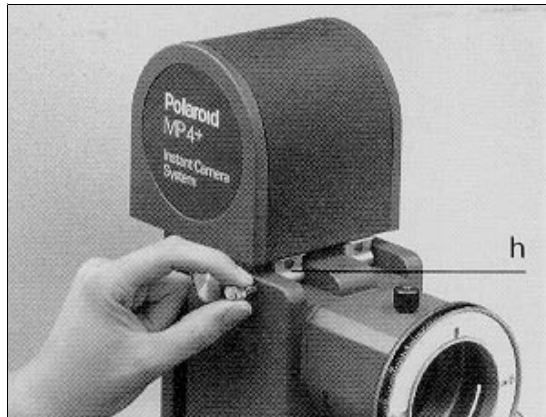


Figure 2-12. Inserting Pin through Spring Loop

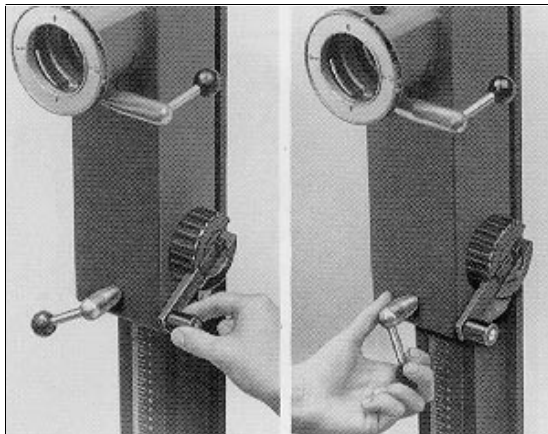


Figure 2-13. Lowering and Locking Vertical Carriage

3. Attach Camera Body to Vertical Carriage

- a. Loosen the knob (i, figure 2-14) until it is in a vertical position. Also loosen screws (j) by about three full rotations.

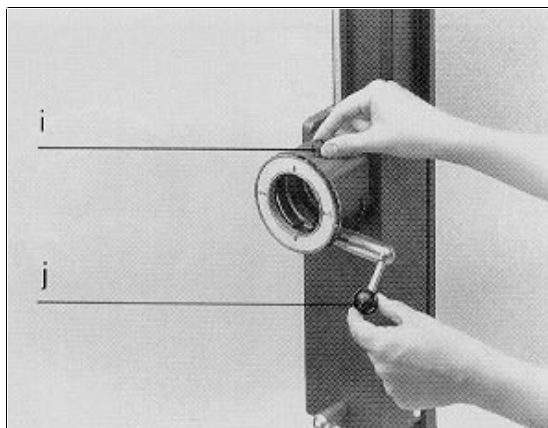


Figure 2-14. Locking Knob and Screw

- b. Orient the camera body as shown in figure 2-15, then push it all the way onto the carriage (figure 2-16). Rotate it back and forth slightly, until you feel it click into the true vertical position. Tighten the screw and then the knob.



Figure 2-15. Orienting Camera Body

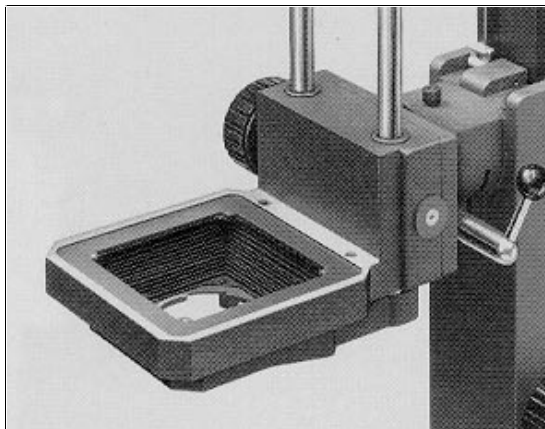


Figure 2-16. Camera Body on Vertical Carriage

4. Put Shutter on Camera

- a. Screw the exposure cable release into its socket (k, figure 2-17).

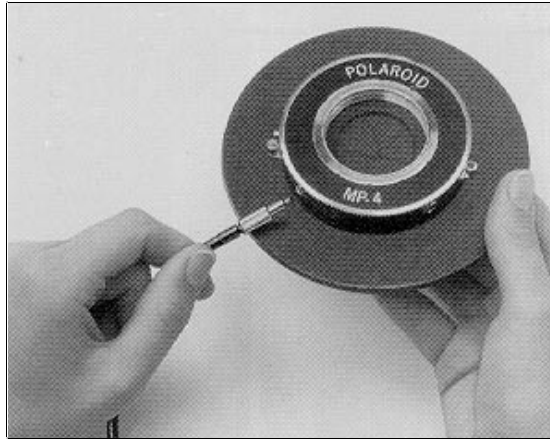


Figure 2-17. Cable Release in Shutter Socket

b. Align the smallest of the three tabs (l, figure 2-18) on the shutter panel with the smallest of the cutouts (m) on the camera body.

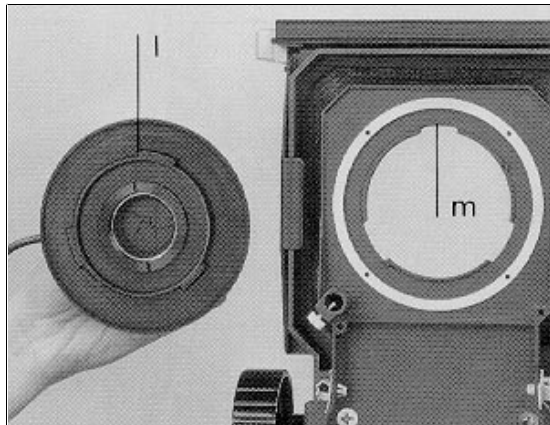


Figure 2-18. Small Tab on Shutter
and Small Slot in Camera

c. Push the shutter unit onto the camera in that orientation. Rotate it in a clockwise direction (figure 2-19) until it comes to a firm stop.

CAUTION

When there is no lens on the shutter, the shutter blades are exposed and unprotected. They are very delicate. **DO NOT TOUCH THEM!**



Figure 2-19. Attaching Shutter to Camera

C. ASSEMBLE THE SLIDING CAMERA HEAD

1. Assembly

- a. Note the orientation of the sliding head. The pins (n, figure 2-20) fit into corresponding holes in the camera body.

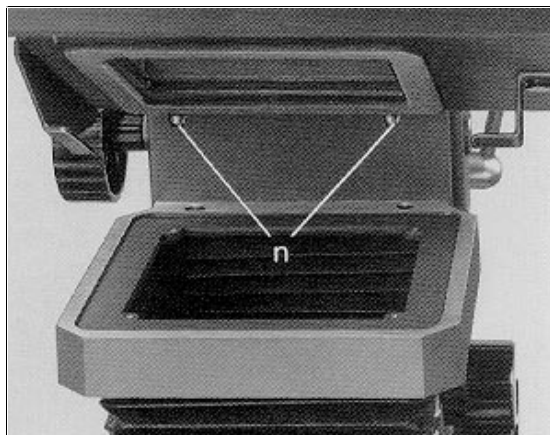


Figure 2-20. Sliding Head Orientation

- b. Hook the camera head onto the left side of the camera body (figure 2-21), then lower the head carefully. Be sure that the pins engage in the holes on the camera body.

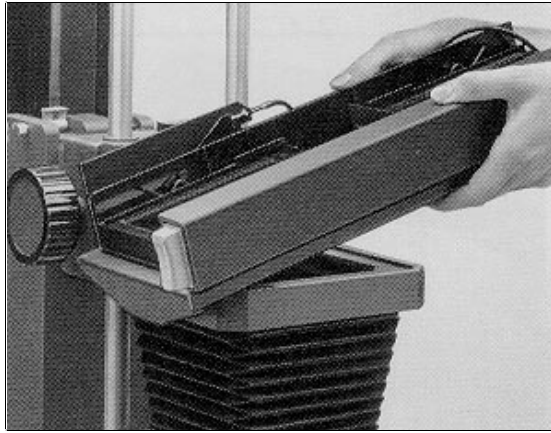


Figure 2-21. Hooking Sliding Head Onto Camera

- c. Lock the head in place by pushing the latch (o, figure 2-22) toward the camera body.

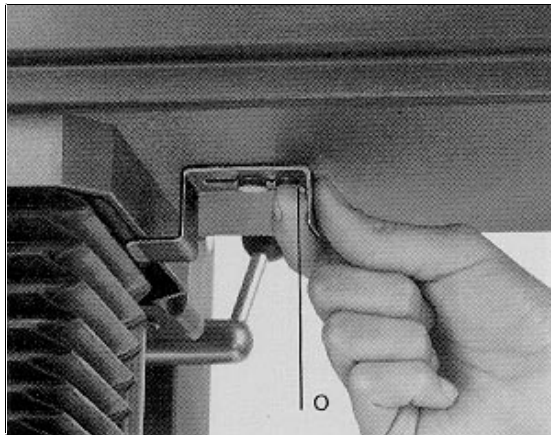


Figure 2-22. Locking Head in Place

2. Sliding the Camera Head

- a. Press the release button (p, figure 2-23) and slide the head all the way to the right for viewing and focusing. Press the other release button to slide the head to the left for picture taking.

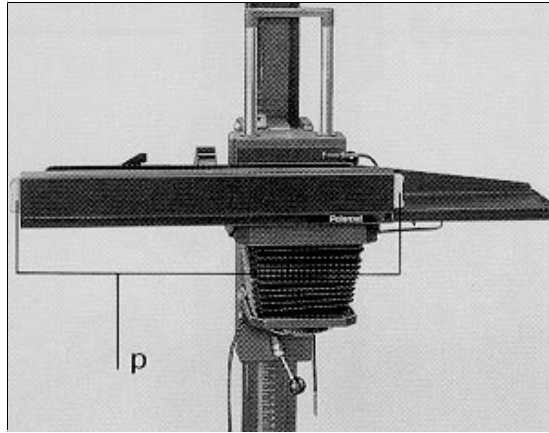


Figure 2-23. Sliding Head Release Buttons

b. Connect the long "pre-view" cable release. Do this with the camera head in the picture taking position (pushed all the way to the right). Screw the release into the "pre-view" socket on the shutter (figure 2-24).

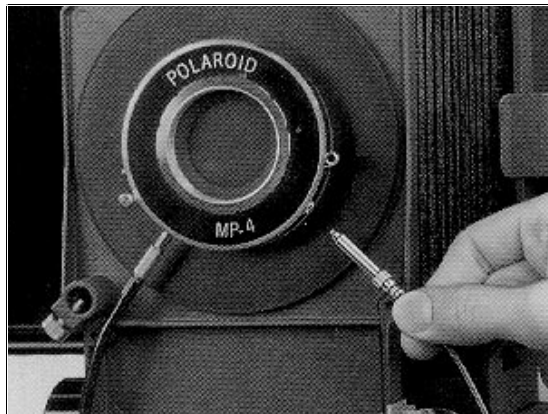


Figure 2-24. Attaching Pre-View Cable to Shutter

c. Look at the shutter from above; the shutter blades should be fully closed (figure 2-25). Now push the head all the way into the viewing position. The shutter blades should be fully open (figure 2-26). If they are not, adjust the plunger end (q) of the release until the shutter functions as described.

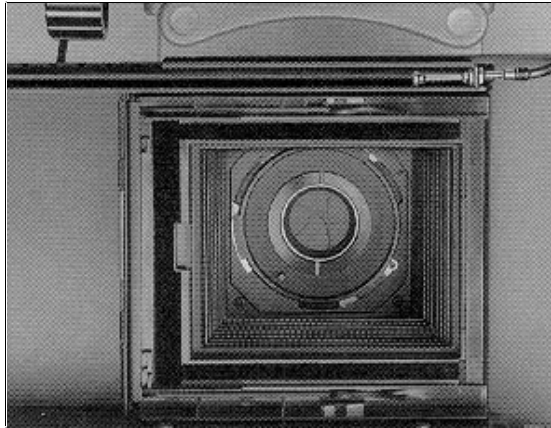


Figure 2-25. Shutter Fully Closed

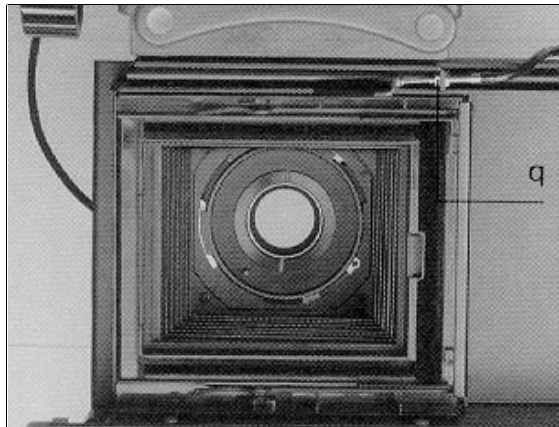


Figure 2-26. Shutter Fully Open

d. Fit the cable releases into the clamps (figure 2-27). This will prevent damage to the shutter if the cable is accidentally pulled.

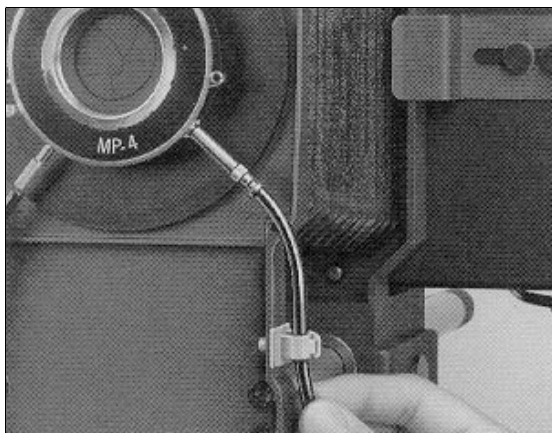


Figure 2-27. Attaching Cables to Clamps

3. Attach Lens to Shutter

- a. Carefully screw the lens into the shutter (figure 2-28).

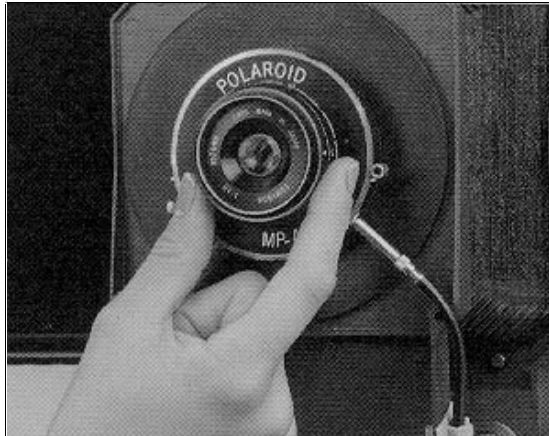


Figure 2-28. Attaching Lens to Shutter

4. Attach the Ground Glass

- a. One end of the ground glass frame has two small protrusions (r, figure 2-29) near its base. Hold the frame in the left hand with the protrusions pointing to the left.

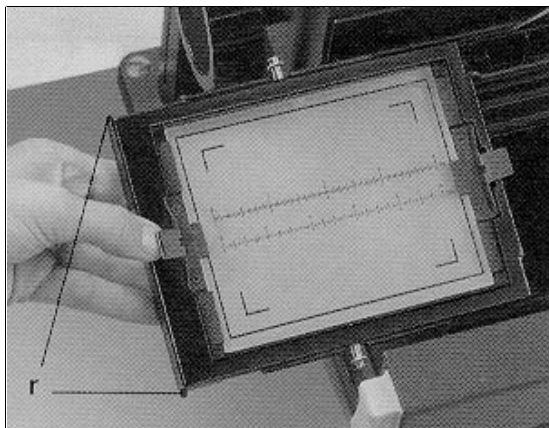


Figure 2-29. Orienting Ground Glass

- b. Slide the ground glass frame into the camera head from the left (figure 2-30). Slide it all the way in, so that the two retainer pins on the frame engage securely in the two spring loops on the camera head.

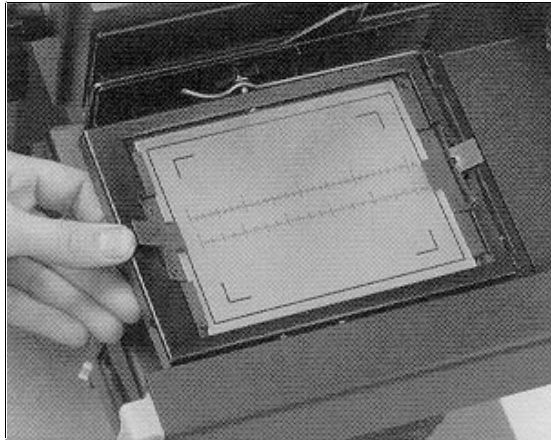


Figure 2-30. Attaching Ground Glass

5. Attach the Reflex Viewer

- a. The pins on the sides of the viewer fit into the slots on the ground glass frame (figure 2-31).

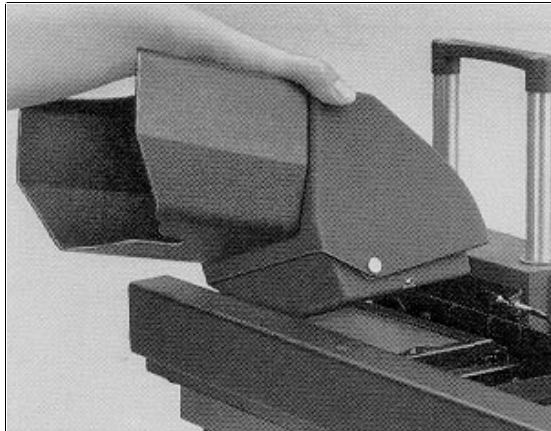


Figure 2-31. Attaching Reflex Viewer

6. Attach the Film Holder Adapter

- a. If using a Polaroid Model 545, 550 or 405 Film Holder, insert the U-shaped adapter. Orient the adapter as shown (figure 2-32). Slide it all the way into the head, so the pins (s) fit under the springs (t).

WARNING

When using the sliding camera head with heavy accessories (such as one or two macro extensions), always lock the vertical carriage on the column as soon as you have raised or lowered the camera. If you do not, the camera may begin to slide down the column because of the extra weight.

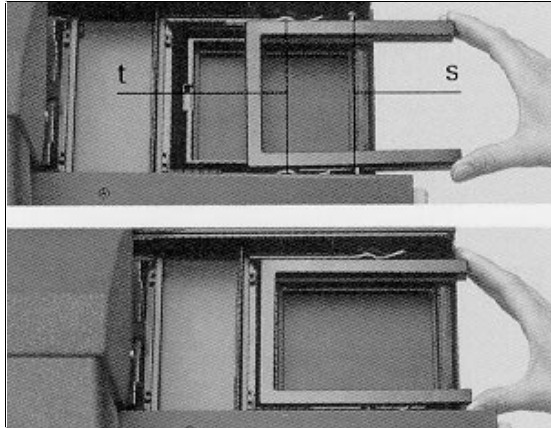


Figure 2-32. U-Shaped Adapter, Pins, and Springs

D. ATTACH THE LAMP ARMS

1. Lamp Arms

The two lamp arms fasten to the left and right sides of the baseboard, near its rear edge.

- a. Orient the lamp arms so the screw faces up (figure 2-33) and the angel indicator faces the front of the baseboard (figure 2-34).

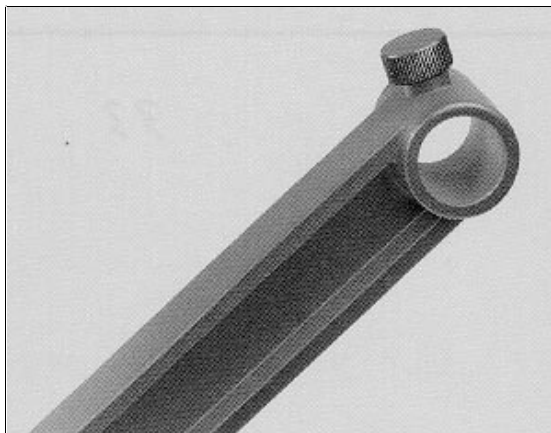


Figure 2-33. Lamp Arm Orientation, Screw at Top

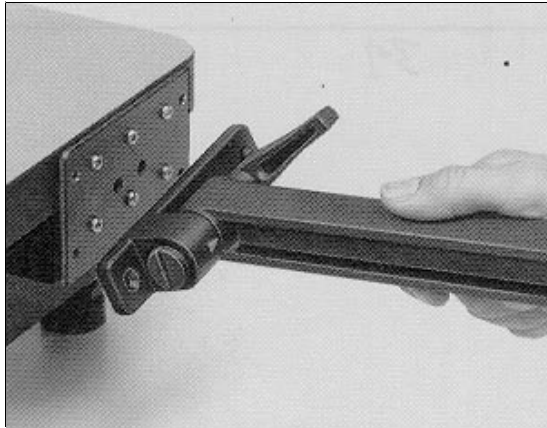


Figure 2-34. Lamp Arm Orientation, Angle Indicators Facing Front of Baseboard

b. Insert the screws into the top two holes in the metal plate, then tighten firmly (figure 2-35).

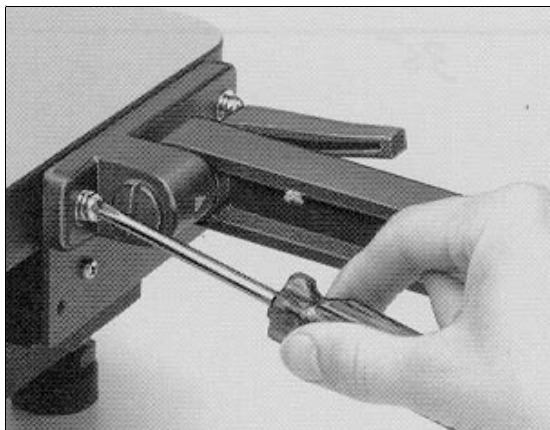


Figure 2-35. Tightening Lamp Arm Screws

c. Orient the horizontal cross bars as shown in figure 2-36. With the MP-4 Plus standard model, note that distance (u) is slightly shorter than distance (v).



Figure 2-36. Cross Bar Orientation

d. Attach the cross bars. Slide the cross bars into the top of each lamp arm (figure 2-37). Rotate the bar until the groove (w) points down and the second groove (x) is aligned with the fastening screw. Tighten the fastening screw to lock the bar in place.

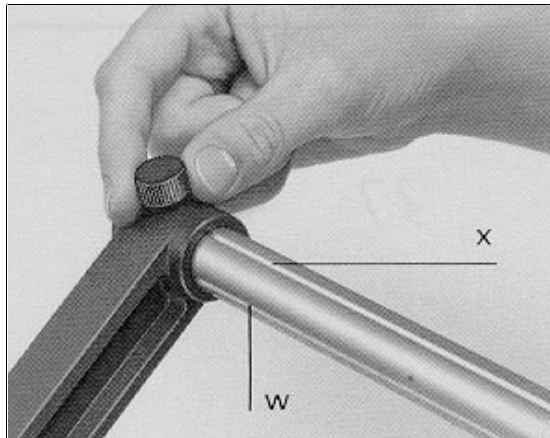


Figure 2-37. Tightening Screw on Lamp Arm and Groove on Cross Bar

e. Angle the lamp arms. Angle them as indicated by the two marks and lock them position with the lever. This puts the lamps in the correct position for most general copying work. For special lighting requirements, the lamp arms may be angled in any way desired.

The lamp arms are designed for use with various types of lighting equipment; see the appropriate paragraphs in this section for details on locating the lamps on the cross bars.

E. ATTACH THE TIMER

The timer may be attached to any convenient location, such as the front of the sliding head (figure 2-38) Simply remove the paper backing from the adhesive strip on the back of the timer, and press it into position.

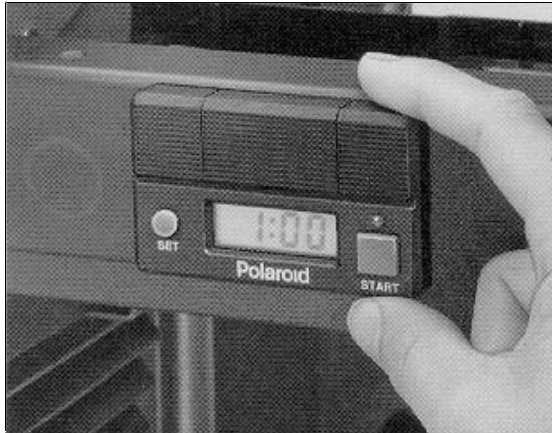


Figure 2-38. Attaching Timer to Sliding Head

The timer is powered by two batteries. If the timer stops working, or if the display or tones fade, replace the batteries.

To replace the batteries, slide the door open (figure 2-39) and insert the new batteries in the orientation (+/-) indicated in the compartment.

NOTE

After replacing the batteries, press the SET and START buttons simultaneously, to ensure proper functioning of the timer.



Figure 2-39. Timer Batteries in Compartment

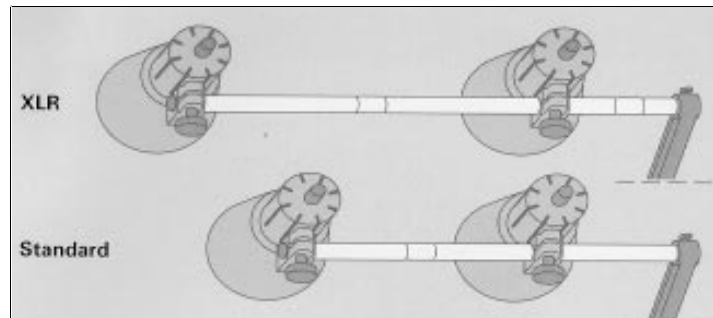


Figure 2-40. Tungsten Lighting System

F. TUNGSTEN LIGHTING SYSTEM

Generally the lamps are attached to the lamp arms (figure 2-40), but they may also be used on separate light stands. The mounting bracket on each lamp holder is threaded to accept a standard tripod screw.

The tungsten lighting system requires four 150 watt reflector flood lamps, which may be purchased separately. **NEVER USE LAMPS OF A HIGHER WATTAGE THAN RECOMMENDED.**

1. Assembly

- a. Loosen the knob on the lamp holder mount, and slide the lamp into its correct location on the cross bar (figure 2-41).



Figure 2-41. Attaching Lamp

- b. Tilt the lamp as needed so the pointer on the mount (a, figure 2-42) is aligned with the lower groove on the cross bar. Then tighten the knob.
- c. Repeat steps a and b for the other three lamps.



Figure 2-42. Aligning Pointer with Groove

d. Loosen the locking level (b, figure 2-43) and adjust the angle of each arm so the indicators (c) are aligned. This will place the lamps at the correct angle for most photography.

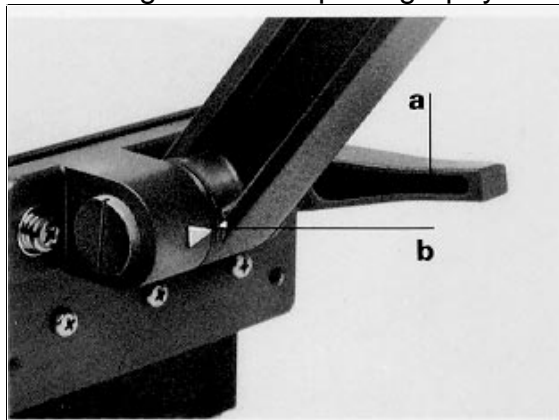


Figure 2-43. Adjusting Arm Angles

e. Run the electric cords down the side of the lamp arm and clamp them at the top and bottom of the arm, using the clips provided (figure 2-44).

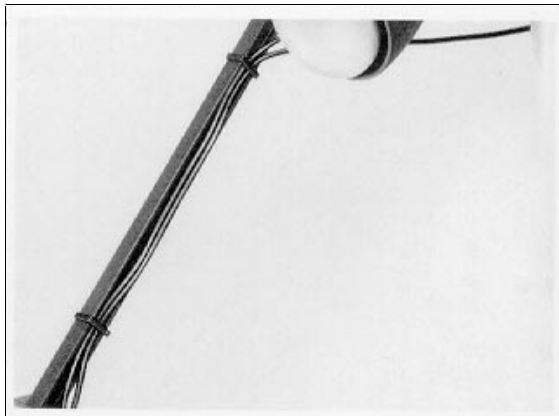


Figure 2-44. Dressing Electric Cords

f. Plug the lamp cords into the white outlets on the baseboard. Use the white switch (figure 2-45) to turn them on and off.

WARNING

The lamps get hot. Do not touch them or place them too close to camera bellows, drapes, clothing, or other flammable materials. To avoid electrical shock hazards, do not immerse lamps in water or other fluids. If service or repair work is required, contact authorized service center.

CAUTION

Always turn power off when the system is not in use. If the system will not be used for an extended period, unplug the power cord from the electric outlet.

NOTE

When tungsten lights are aligned as shown in figure 2-46, they will provide even illumination over the entire baseboard. This is most important when photographing large subjects and when using high-contrast films.

The exposure guide included with the lights is based on this standard alignment. If the lights are positioned in a different manner, the recommended exposure may require adjustment.

G. HALOGEN LIGHTING SYSTEM

Generally the lamps are attached to the lamp arms (figure 2-47), but they may also be used on separate light stands. The mounting bracket on each lamp is threaded to accept a standard tripod screw.



Figure 2-45. Baseboard Switch

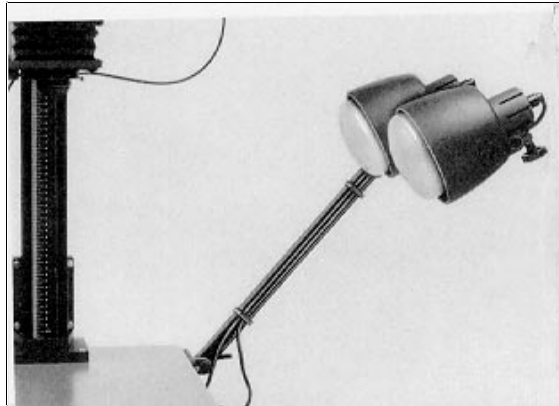


Figure 2-46. Two Lamps on Crossbar

The halogen lighting system requires two 300 watt halogen lamps, which may be purchased separately. NEVER USE LAMPS OF A HIGHER WATTAGE THAN RECOMMENDED.

1. Assembly

- a. Loosen the knob on the lamp mount and slide the lamp into its correct location on the cross bar (figure 2-48).
- b. Tilt the lamp so it is aimed at about a 45° angle to the baseboard (figure 2-49), then tighten the knob.

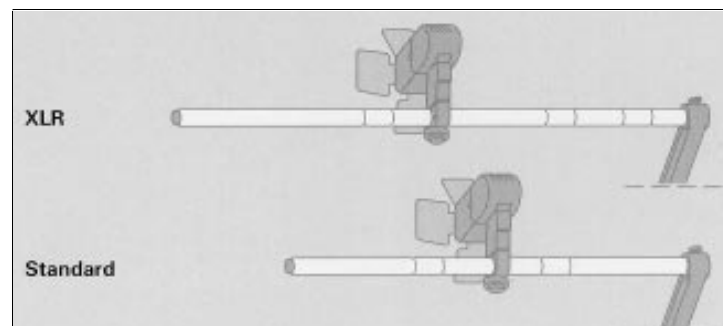


Figure 2-47. Halogen Lighting System



Figure 2-48. Attaching Lamp

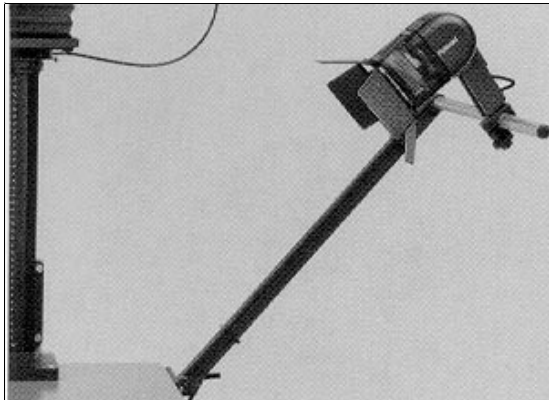


Figure 2-49. Orienting Lamp

- c. Repeat steps a and b for the other lamp.
- d. Loosen the locking lever (a, figure 2-50) and adjust the angle of each arm so the indicators (b) are aligned. This will place the lamps at the correct angle for most photography.

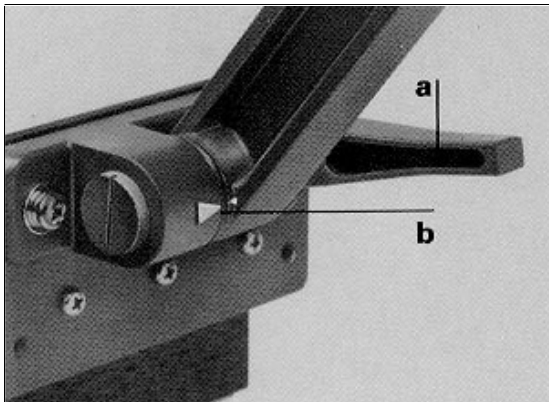


Figure 2-50. Aligning Lamp Arms

e. Run the electric cord down the side of the lamp arm and clamp it at the top and bottom of the arm, using the clips provided (figure 2-51).

f. Plug the lamp cords into the black outlets on the baseboard. Use the black switch (figure 2-52) to turn them on and off. The ON/OFF switch on the back of the lamp (figure 2-53) may be left ON.

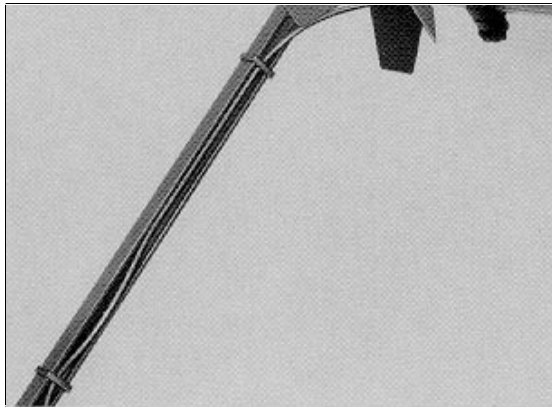


Figure 2-51. Dressing Cords

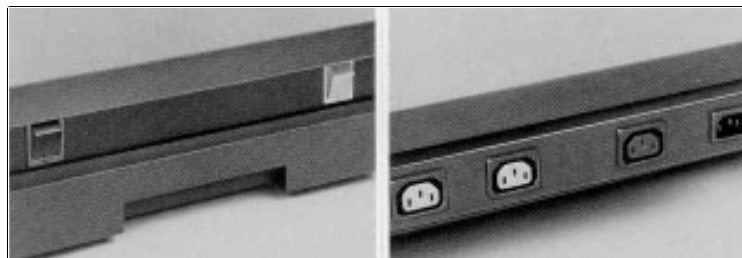


Figure 2-52. Baseboard Switch and Outlet



Figure 2-53. ON/OFF Switch on Light

WARNING

The lamps get hot. Do not touch them or place them too close to camera bellows, drapes, clothing or other flammable materials. To avoid electrical shock hazards, do not immerse lamps in water or other fluids. If service or repair work is required, contact authorized service center.

CAUTION

Always turn power off when the system is not in use. If the system will not be used for an extended period, unplug the power cord from the electric outlet.

NOTE

When halogen lights are aligned as shown in figure 2-54, they will provide even illumination over the entire baseboard. This is most important when photographing large subjects and when using high-contrast films.

The exposure guide included with the lights is based on this standard alignment. If the lights are positioned in a different manner, the recommended exposure may require adjustment.

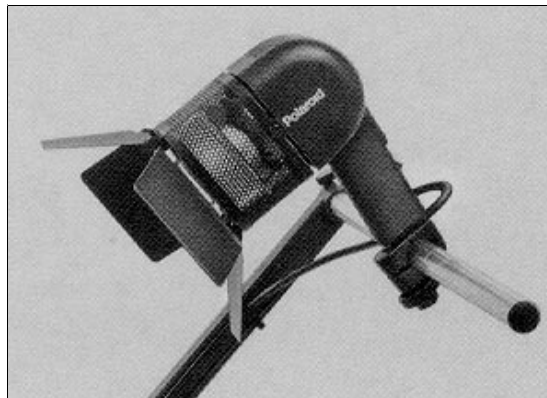


Figure 2-54. Normal Lamp Angle

When photographing subject at higher magnifications, you may wish to tilt the lamps down, to move them closer to the baseboard (figure 2-55). You should also close the barn doors slightly, to prevent aiming the light at the lens.

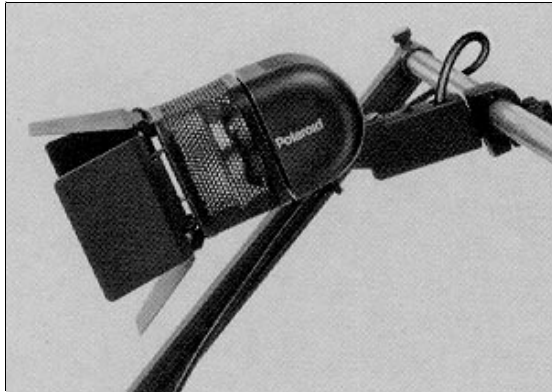


Figure 2-55. "Close-Up" Lamp Angle

2. Replacing the Lamp

- a. Disconnect the lamp power cord from the electrical outlet and remove the lamp from the crossbar.
- b. Remove the front to the lamp housing (figure 2-56).

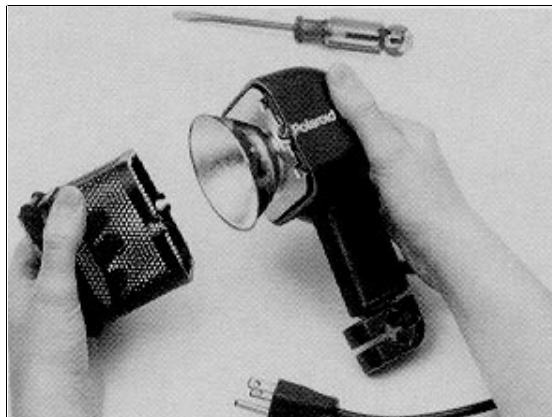


Figure 2-56. Removing Housing

- c. Keep the new halogen lamp in its protective wrapping while installing. Never touch the lamp with your bare fingers; fingerprints on the lamp can greatly reduce lamp life.
- d. Align the pins on the lamp with the openings in the socket (figure 2-57) and push the lamp firmly into position.

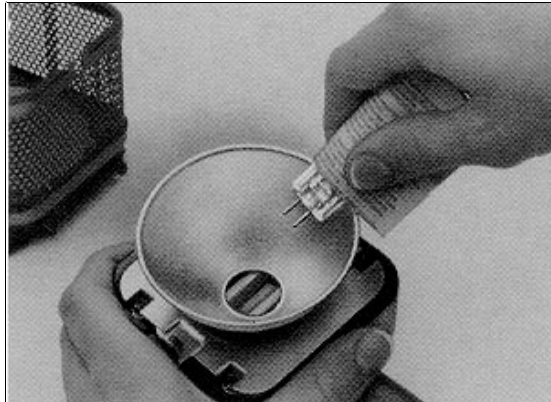


Figure 2-57. Inserting Lamp

e. Replace the lamp housing.

WARNING

Never operate the lamp without the front housing in place.

3. Replacing the Fuse

The lamp has a fuse holder on the back of the housing (figure 2-58). Use a coin or screwdriver to turn the fuse cover in a counterclockwise direction to open it. Replace the fuse with one of the same type.



Figure 2-58. Replacing the Fuse

H. INSTALLING HOSPITAL PLUG

Some hospital regulations require that electrical equipment used in their facility have a grounded transparent plug. The MP-4 requires five such plugs. The procedure for installing one is as follows:

1. Remove the existing plug.

2. Remove the power cord jacket and strip the conductors as shown in figure 2-59. Avoid cutting the jacket more than 0.44 inch.

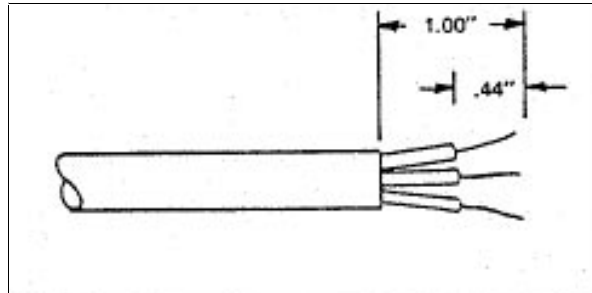


Figure 2-59. Preparing Cord for New Plug

3. Using hospital plug assembly part number 730054 (figure 2-60), insert the stripped conductors into the appropriate terminals of the assembly (see table below) and tighten the screws.

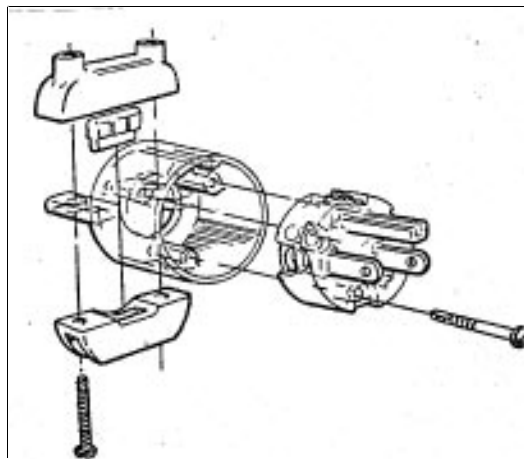


Figure 2-60 Hospital Plug Assembly

CONDUCTOR COLOR	SCREW COLOR
BLACK	BRASS
WHITE	SILVER
GREEN OR GRN/YELLOW	GREEN

SECTION 3

OPERATION

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A. FILM HOLDER USE

Instructions for using the Models 545, 550, and 405 film holders are provided with the holders.

1. Loading the MP-4 Plus 44-48 Film Holder

Generally the film holder should be loaded before it is inserted into the camera head.

- a. Pull both sides of the latch to open the door; the door does not open flat. Before loading film, check that the two steel rollers are clean (see the paragraph on Cleaning the Developer Rollers).
- b. Hold the film pack by the edges, not in the center. Insert the pack at an angle, then push it down into position (figure 3-1).
- c. Check that the white tabs are free, not caught between the pack and film holder. See figure 3-2.

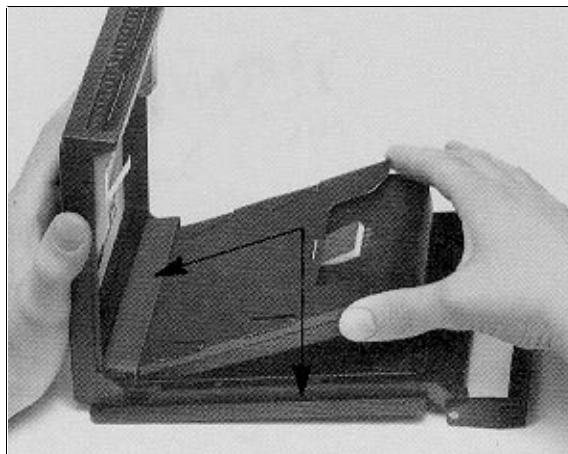


Figure 3-1. Inserting Film Pack

- d. Close and latch the door, with the end of the black tab sticking out of the slot. Do not pull the black tab at this time.
- e. Remove the dark slide from the film holder (figure 3-3), then insert the holder into the camera head.



Figure 3-2. Checking Tabs

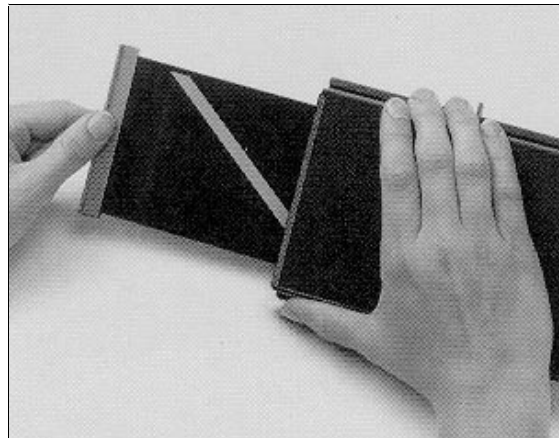


Figure 3-3. Removing Dark Slide

2. Inserting the Film Holder

44-48 Film Holder: Slide the holder all the way into the right side of the camera head (figure 3-4). Be sure that the two locking pins (a) on the holder engage the springs on the camera head.

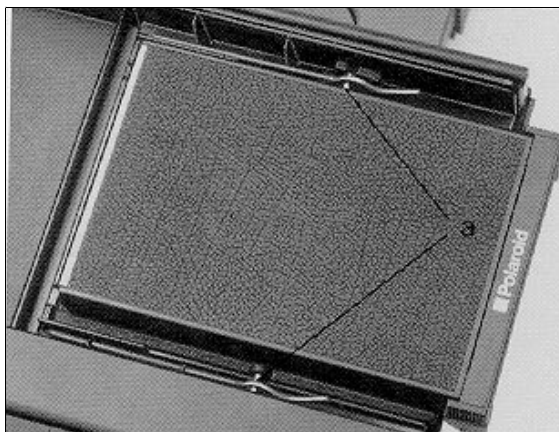


Figure 3-4. Inserting 44-48 Film Holder

Pull the black tab all the way straight out of the holder (figure 3-5). A small white tab should appear. If it does not, see the "No White Tab?" paragraph.

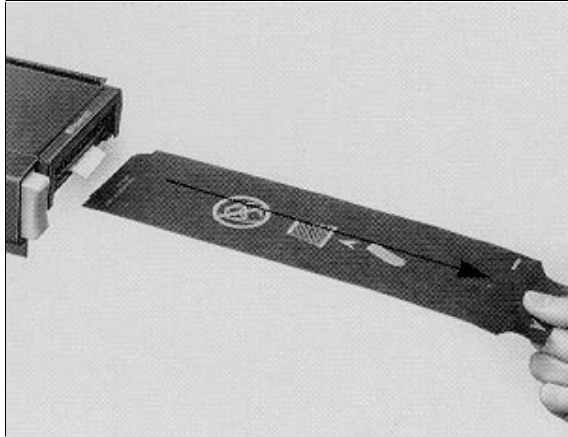


Figure 3-5. Pull Out Black Tab

Model 405 Film Holder: Load the film in the usual manner, but do not pull the black tab until the holder is inserted into the camera. Remove the dark slide.

Model 550 Film Holder: Load the film in the usual manner.

Model 545 Film Holder: This holder may be loaded while inserted in the camera head.

The Models 545, 550, and 405 film holders fit under the U-shaped adapter (see Section 2).

Slide the film holder under adapter (figure 3-6). Push it all the way in, so it is firmly seated.

B. SET THE FILM PROCESSING TIMER

Press and hold the SET button (figure 3-7) until the correct processing time is displayed (see the film instructions for recommended times). The timer will always return to this setting after a processing cycle. To reset the timer to a new time:

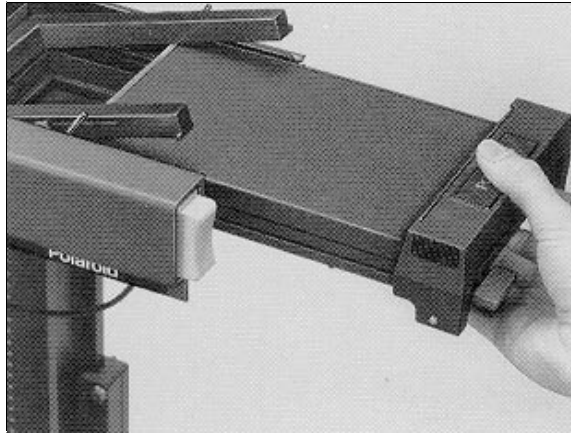


Figure 3-6. Inserting Model 550 Film Holder

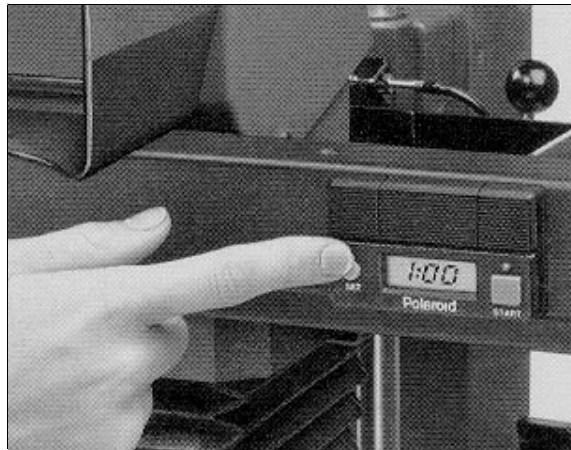


Figure 3-7. Setting the Timer

To reset it to a longer time than is displayed, simply press and hold the SET button until the new time is displayed.

To reset it to a shorter time:

- Press the SET and START buttons simultaneously. The preset time is canceled and zero is displayed.
- Press and hold the SET button until the new time is displayed.

C. CAMERA OPERATION

1. Determine the approximate reproduction scale. Measure the original subject (or area to be photographed), and the final size needed. Select the lens to be used and attach it to the shutter.

Set the lens at its largest aperture (lowest f-number). This will provide the brightest possible image for focusing on the ground glass.

2. Turn on the power (press the switch on the front of the baseboard; see figure 3-8) Then, if necessary, turn on the lights.

CAUTION

Turn off lights and power when not in use. If system will not be used for an extended period of time, unplug from electrical outlet. Grasp plug (not cord) and pull to disconnect.

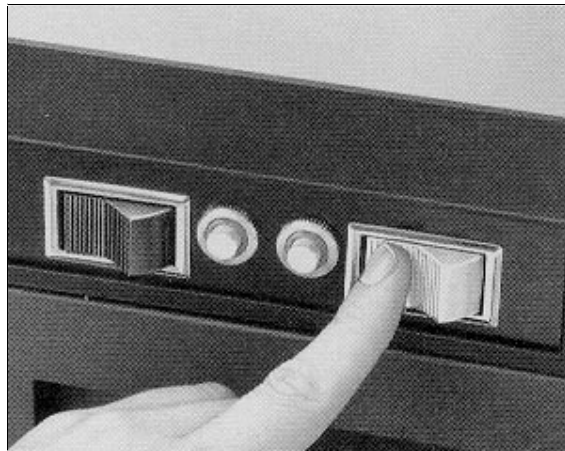


Figure 3-8. Turning on Power

3. Slide the camera head into the viewing position: Press the button (b, figure 3-9) and, while holding it in, push the head all the way to the right, so that the reflex view/ground glass is above the lens.

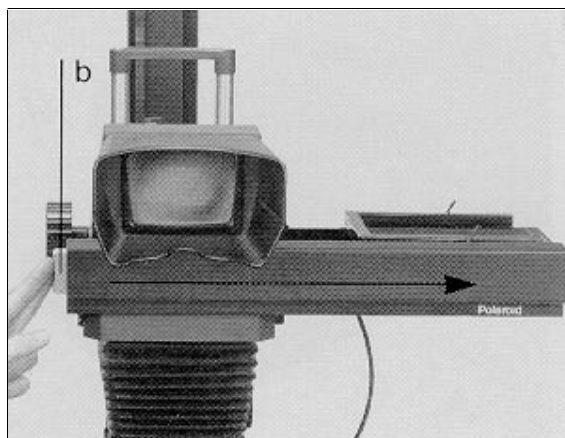


Figure 3-9. Sliding Camera Head to Right

4. Place the original subject on the baseboard and frame the image. If you are using a ground glass only, the image will appear upside down. If you are using the reflex viewer, the image will appear right side up, but reversed left to right.

5. Size and focus the image. Turn the locking lever (c, figure 3-10) counterclockwise to release the carriage. While viewing the image on the ground glass, turn the crank (d) to adjust the height of the camera until the image on the ground glass is about the required size.

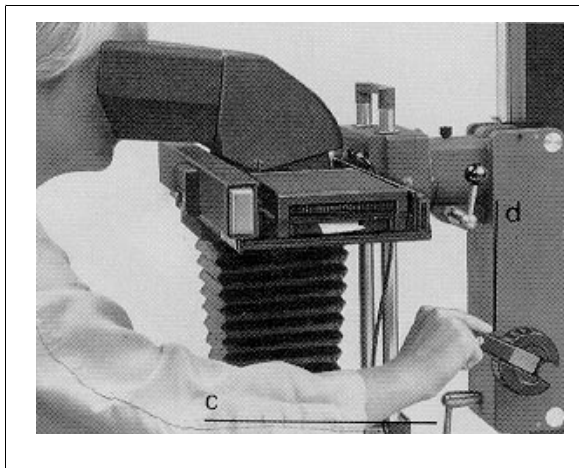


Figure 3-10. Adjusting Camera Height

Adjust the focusing knob (e, figure 3-11) until the image is sharp. At this point the image may not be exactly the correct size. Adjust the camera height again and refocus. You may have to repeat this several times, until the image is both exactly the right size and also in focus. (See also the paragraph on "Sizing and Focusing.") Finally, lock the carriage in position by turning the locking lever clockwise, without excessive force.

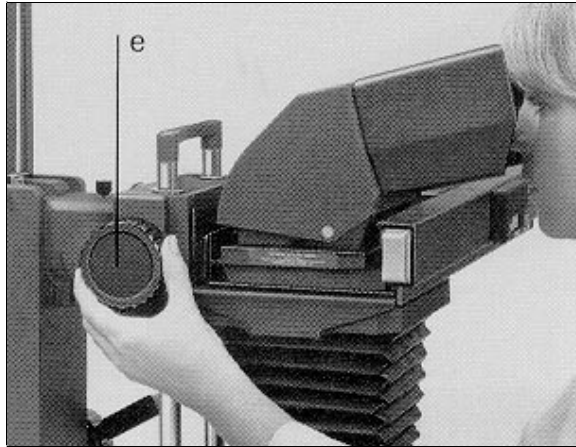


Figure 3-11. Adjusting Bellows Knob

6. Center the subject on the baseboard in the way you want to reproduce it. Remember to use the ground glass marking that is intended for the film format you are using.
7. Slide the camera head into the picture-taking position. Press the button, and while holding it in, slide the head all the way to the left (figure 3-12) to place the film holder above the lens.

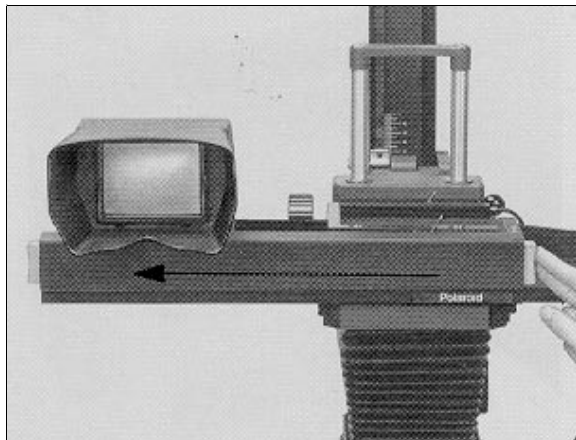


Figure 3-12. Slide Head to Left

If using a Model 545 film holder, pull out the envelope (figure 3-13). With a Model 550 film holder, pull out the dark slide (figure 3-14).

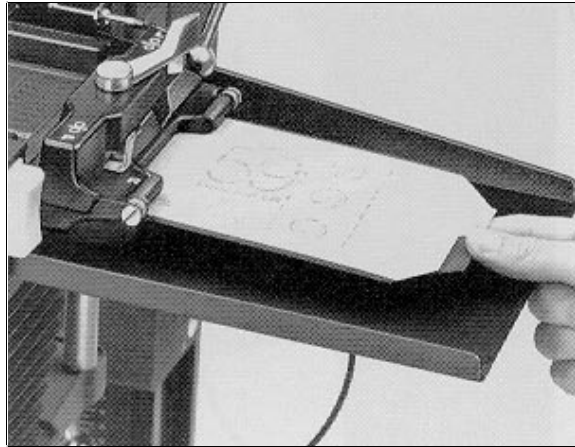


Figure 3-13. Pull Out 4 x 5 Envelope

8. Set shutter speed and lens aperture for correct exposure. Use the exposure guide supplied with the lights. (See also the paragraph on "Guide to Exposure Control.")

To set the shutter speed, turn the silver ring to place the indicator (f, figure 3-15) at the desired speed. Never set the indicator between shutter speeds.

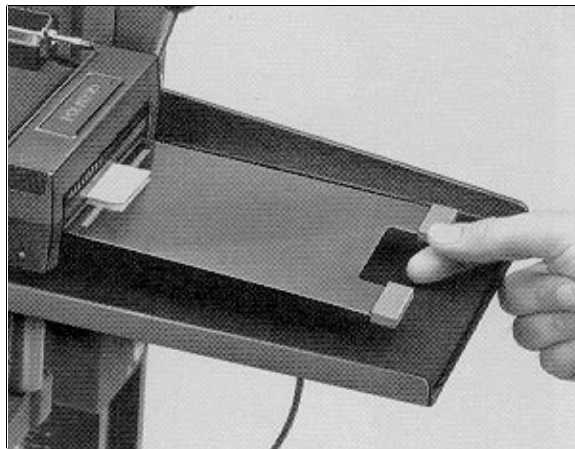


Figure 3-14. Pull Out Model 550 Dark Slide

To set the lens aperture, turn the lens ring to place the desired aperture opposite the dot (g). The ring will click into position. The lens may be set between full aperture settings.

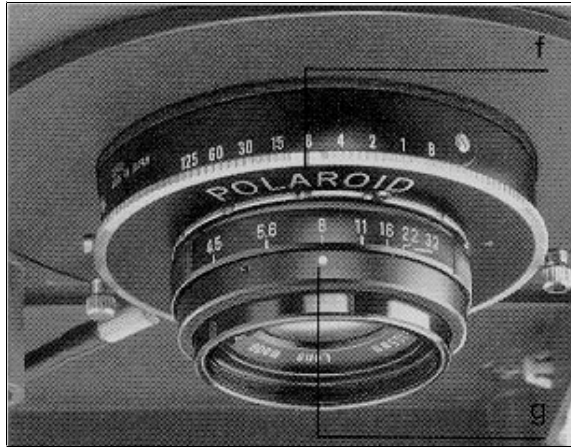


Figure 3-15. Shutter/Lens Indicator

9. Make the exposure: Gently press the plunger on the cable release (figure 3-16).

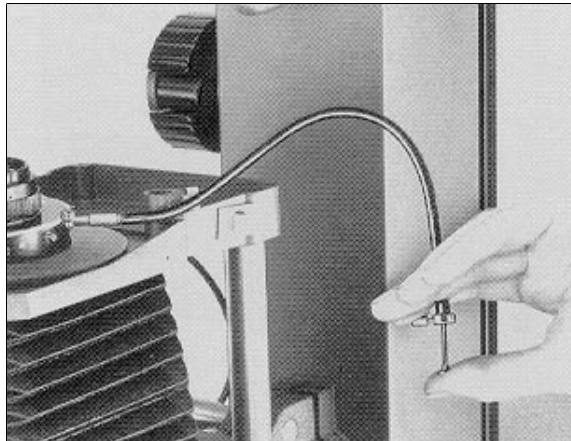


Figure 3-16. Taking the Picture

D. PROCESSING THE FILM

CAUTION

If film holder is at same height as lights, turn lights off before pulling film tabs, to prevent burns and fogging film.

1. Pull the white tab all the way straight out of the film holder (figure 3-17). A large yellow tab will appear. (If not, see the paragraph "No Yellow Tab?")

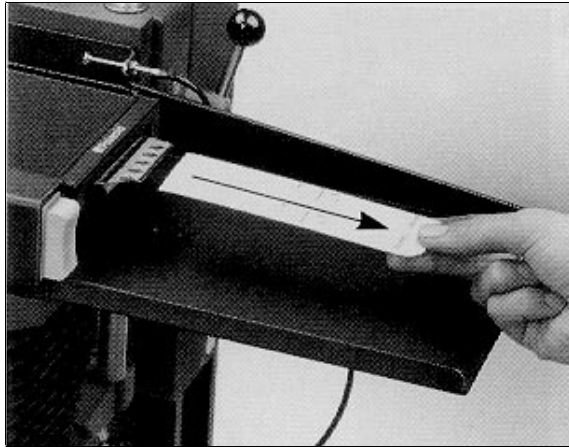


Figure 3-17. Pull White Tab

2. Grip the yellow tab firmly and pull it straight, at moderate speed, all the way out of the holder (figure 3-18).

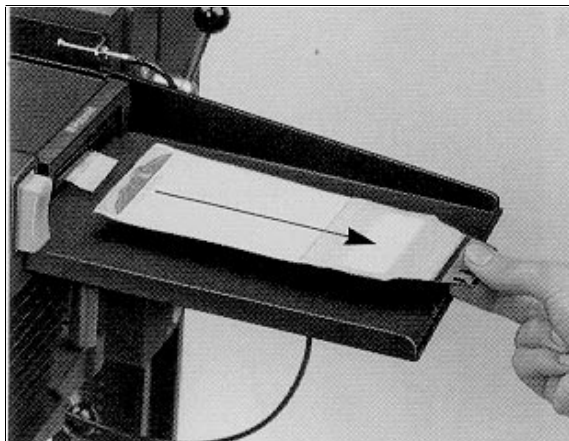


Figure 3-18. Pull Yellow Tab

3. Press the START button on the film processing timer (figure 3-19).



Figure 3-19. Start Timer

4. At the end of the processing time, separate the print from the negative, starting at the end nearest the yellow tab (figure 3-20). Information on the handling of prints and negatives is in the film instructions.

CAUTION

The Polaroid instant film process uses a caustic paste. Avoid contact with skin, eyes, and mouth. Keep away from children and animals. If you get some paste on your skin, wipe it off immediately and wash with water to avoid an alkali burn. If eye or mouth contact occurs, quickly wash the area with plenty of water and see a doctor. Keep discarded materials away from children, animals, clothing, and furniture.

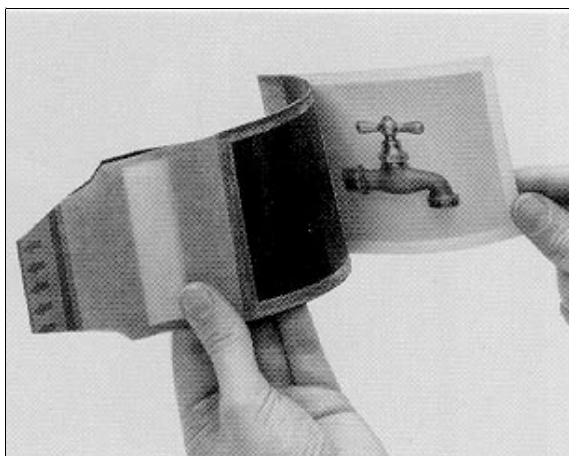


Figure 3-20. Peel Print from Negative

No White Tab?

Carefully open the door, and, without moving the film pack, push the white tab out (figure 3-21). Then close and latch the door.

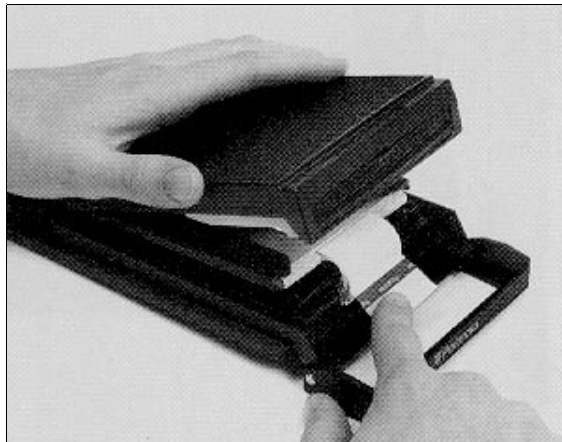


Figure 3-21. Pushing White Tab Out

No Yellow Tab?

Do not pull another white tab.

Instead, carefully open the holder far enough to get a finger on top of the film pack to hold it down (figure 3-22). Grasp the topmost yellow tab and gently pull it all the way out of the holder (figure 3-23) and discard it. Inspect the rollers and clean them if necessary (see the paragraph "Clean the Developer Rollers"). Close and latch the door, with the next white tab sticking out.

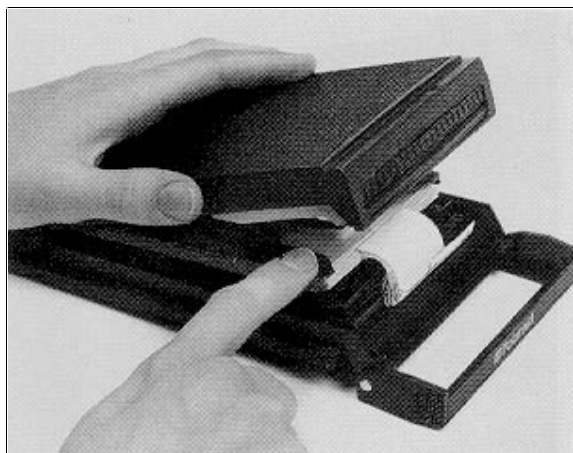


Figure 3-22. Open Door and Hold Pack Down

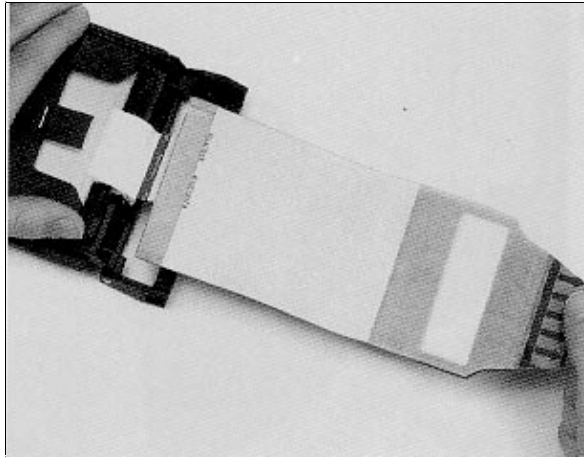


Figure 3-23. Pull Out Top Tab

E. CLEAN THE DEVELOPER ROLLERS

Dirt on the developer rollers can cause a variety of problems, such as repeated spots on pictures and jammed film. Inspect the rollers before loading film, and clean them as follows:

With both hands, lift the steel loops, and remove the roller assembly (figure 3-24).

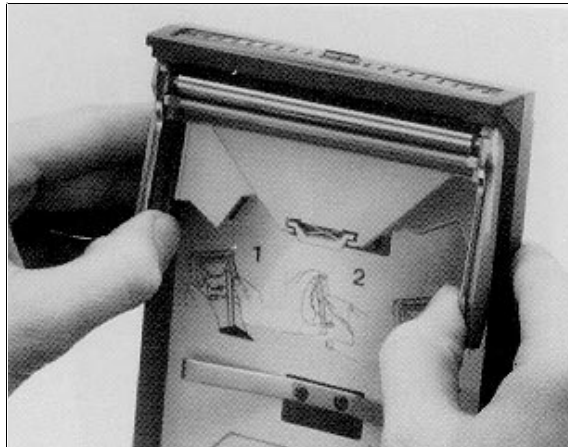


Figure 3-24. Remove Roller Assembly

Clean both rollers with a soft, lint-free cloth, dampened with water if necessary. See figure 3-25. Or, hold the roller assembly under clean running water. Rotate both rollers as you clean and inspect them. Never scrape the rollers with anything metallic, nor with your fingernail, and never attempt to disassemble the rollers. Also clean the film tab slot (figure 3-26), then replace the roller assembly.

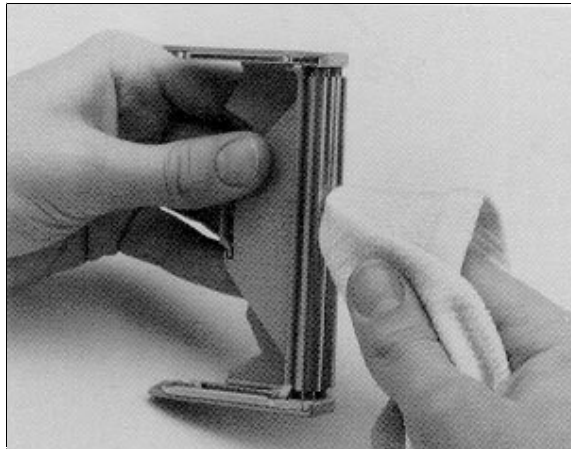


Figure 3-25. Cleaning Rollers

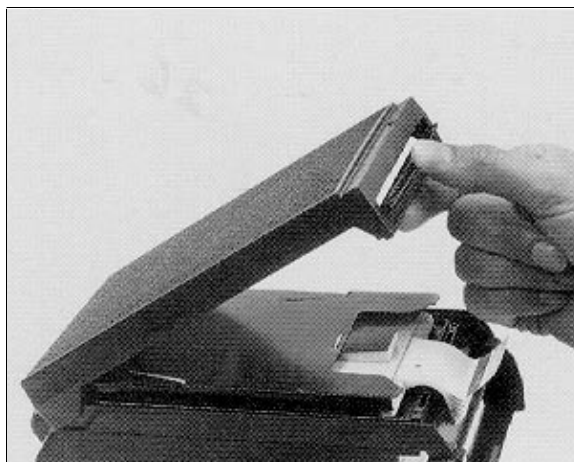


Figure 3-26. Cleaning the Tab Slot

F. LENS SELECTION

Each MP-4 Plus lens is designed for reproductions within a specific range. The following chart shows the approximate ranges.

Lens	Minimum	Maximum*
135mm	10%	1.2X
105mm	20%	1.5X
75mm	1.5X	3X
50mm	1.5X	5X
35mm	5X	7.5X
17mm	10X	20X

* Use one or two macro extensions for additional magnification.

G. SIZING AND FOCUSING

General Rule: To increase the size of the image on the ground glass, lower the camera and lengthen the bellows (figure 3-27). To decrease the size of the image, raise the camera and shorten the bellows (figure 3-28).

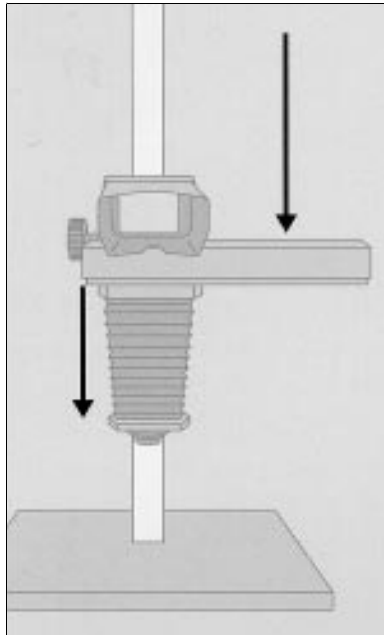


Figure 3-27. Lower Camera and Lengthen Bellows

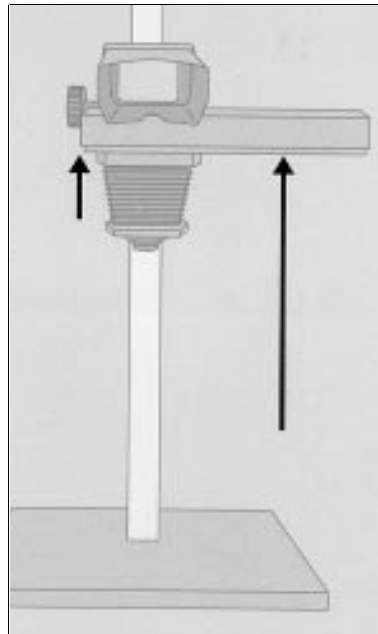


Figure 3-28. Raise Camera and Shorten Bellows

Reductions: First adjust the camera height to get the approximate image size required. Then adjust the bellows for sharp focus.

Magnifications: First adjust the bellows to get the approximate image size required. Then adjust the camera height to attain sharp focus.

Camera Column Scale: When the column scale is read at the point shown in figure 3-29, it represents the film plane to baseboard distance.

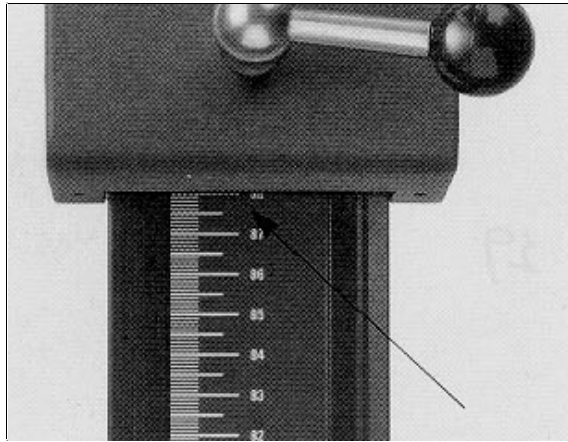


Figure 3-29. Column Scale

Bellows Scale: The scale on the left focusing column represents the bellows extension, when it is read at the point indicated in figure 3-30.

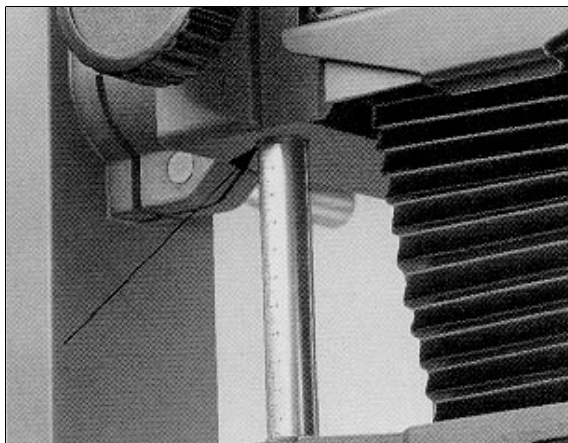


Figure 3-30. Bellows Scale

These scales can be used in conjunction with the tables at the end of this section to set the camera for specific reproduction ratios.

NOTE

If the exact reproduction ratio must be documented, place a ruler on the baseboard and photograph it with the original subject. See figure 3-31. Be sure the ruler is in the same plane as the original subject.

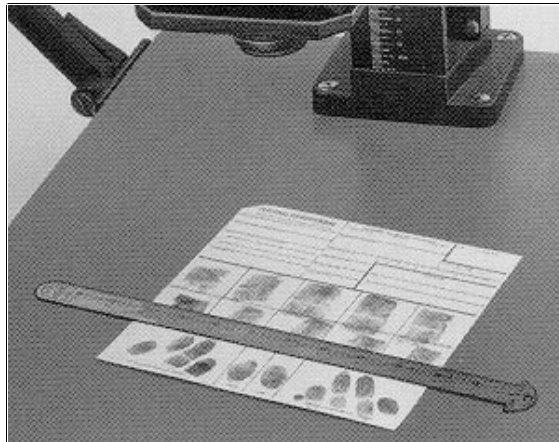


Figure 3-31. Using a Ruler

H. GUIDE TO EXPOSURE CONTROL

Exposure is the amount of light that reaches the film through the lens. It is controlled by the length of time the shutter is open (shutter speed) and the size of the opening in the lens (lens aperture).

The shutter stays open for the length of time indicated on the ring. The numbers signify fractions of a second; thus, $60 + \frac{1}{60}$ sec., $4 + \frac{1}{4}$ sec., $1 = 1$ sec., etc.

The lens opening can be made larger or smaller. The size of the opening is measured in f-numbers, which are marked on the lens ring. The highest f-number indicates the smallest opening; the lowest f-number indicates the largest opening.

Each lens opening will admit either twice as much or half as much light as the one next to it on the ring. Thus, changing from f/11 to f/8 will double the exposure; change from f/11 to f/16 will cut the exposure in half.

I. EXPOSURE CORRECTION

To increase exposure (make pictures lighter), use a longer exposure time (slower shutter speed) or a larger lens aperture (lower f-number). To decrease exposure (make pictures darker), use a shorter exposure time (faster shutter speed) or a smaller lens aperture (higher f-number).

Shutter Speeds							
125	60	30	15	8	4	2	1
Darken/Lighten							
Lens Opening							
4.5	5.6	8	11	16	22	32	
Lighten/Darken							

J. XLR COLUMN ROTATION

The column of the Model XLR can be rotated through an angle of 180 degrees, so that the camera is aimed toward the floor rather than at the baseboard. This position can be useful if you want to photograph something that cannot be easily accommodated on the baseboard.

WARNING

Before you rotate the column, be sure to place an object, or objects, of adequate weight on the baseboard, to prevent the camera from falling over.

If you have a light box in the baseboard, remove the glass cover, and replace it with the baseboard insert. Never place heavy objects on the glass cover.

To rotate the column, loosen the column locking level (h, figure 3-32), turn the entire column to the desired position, and lock the lever again.

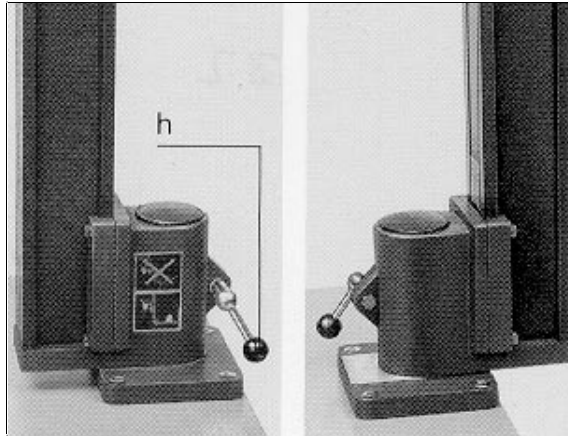


Figure 2-32. Column Locking Lever

Leave the weights on the baseboard (figure 3-33) until the camera head has been returned to its normal position over the baseboard.

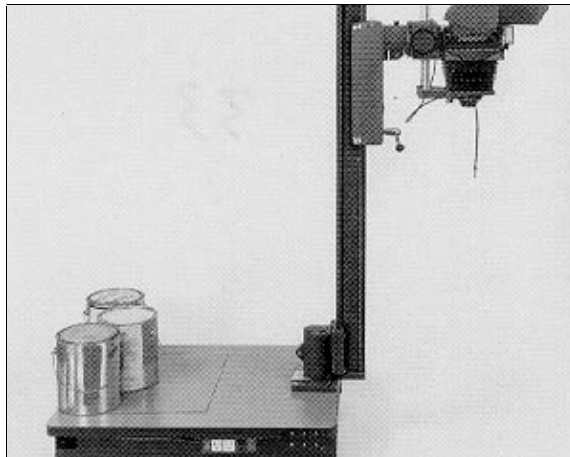


Figure 3-33. Weights on Baseboard

K. CAMERA BODY REMOVAL

You can remove the camera body and use another camera on the MP-4 Plus column (such as the 8x10 camera or a 35mm camera, using the 44-85 Universal Camera Mount. These accessories are described in Section 1.

To remove the camera body, loosen the locking know (i, figure 3-34) until it is vertical. Then loosen the retainer screw (j) by about three full rotations. Pull off the camera body as shown in figure 3-35.

Before replacing the camera body, be sure the locking knob and retainer screw are loosened. Push the camera body all the way on, tighten the retainer screw and then the locking knob.

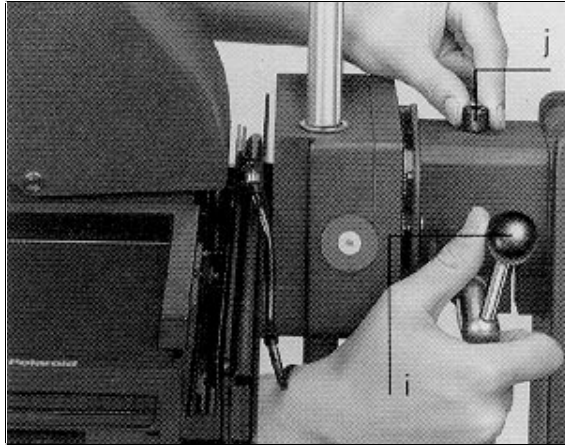


Figure 3-34. Locking Knob and Screw

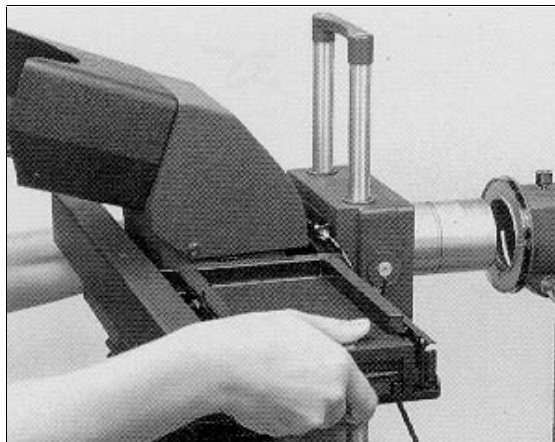


Figure 3-35. Removing Camera Body

L. PICTURE FAULTS AND PROBABLE CAUSES

Repeated, evenly spaced spots: Dirt on the steel developer rollers.

Missing corners or orange-red marks along edges: Caused by pulling the yellow tab out at an angle.

Oblong in print: The white tab was not pulled all the way out. When the yellow tab was pulled, that white tab was pulled back into the film holder.

Many small white specks: Caused by pulling the yellow tab out too fast. This can also cause pink lines, streaks, or blotches on color prints.

Muddy-looking print: The print was not processed for a long enough time. Underprocessed color prints may be brownish pink.

Broad streak or curtain-shaped mark: Due to hesitation or stopping while pulling out the yellow tab.

Very light image or none at all: The film was fogged or extremely overexposed. See the Guide to Exposure Control.

Nearly black or solid image: Caused by insufficient or no exposure. Be sure the black tab and dark slide have been removed, and that the electronic flash fired (if used). See also the Guide to Exposure Control. See the instructions supplied with the film holders for additional information.

M. MP-4PLUS CARE AND MAINTENANCE

Polaroid film holders: The two steel rollers in each film holder must be kept absolutely clean, to prevent spots on picture and jammed film. Always check the rollers before loading film; clean them with a damp cloth as explained in the instructions packaged with the holder.

Lens and shutter: Never touch the surface of a lens. You can remove fingerprints and smudges by wiping gently with lens tissue or a soft, lint-free cloth. The elements in each lens are precisely mounted and aligned by the manufacturer, and should be removed only by a qualified camera repair technician. The shutter is lifetime lubricated; do not attempt to oil or adjust it.

Reflex viewer: The reflex viewer contains a front-surface mirror, which is easily scratched or damaged. Do not touch it. Remove fingerprints with a soft, lint-free cloth; use an antistatic brush to remove dust.

Moving parts: Never attempt to lubricate any part of the assembly. All moving parts are lubricated at the factory, for smooth performance over a long period of time. Keep all parts of the camera clean, and cover the entire system when it is not in use.

EXPOSURE GUIDE FOR MP-4 CAMERA & LIGHTS & POLAROID LAND FILMS

The MP-4 lamps and lamp arms should be positioned and angled for regular copying work, as indicated on the equipment and in the MP-4 instruction book. The lamps must be of the correct voltage for the power supply used.

This is intended as an exposure guide, and not a precise exposure indicator. Each user will experience unpredictable variable in his operating conditions, which will affect exposure to some extent. Among these are the brightness of "uninvited" window light or room lighting, differences in color and contrast of the subject material, line voltage fluctuation, and the age of the lamps.

How to use the tables:

Table A: Find the number that applies to the film type you are using. Example . . . 4

Table B: Measure the length of the material being copied and the length of its focused image on the ground glass, to determine the reproduction scale. In this table, find the appropriate number. Example . . . 2

Table C: Decide which lens f-number you wish to use. Find the number that corresponds to that f-number. Example . . . 5

Add the numbers you have taken from A, B, C. Total of examples given . . . 11

Table D: Find the number that represents this total. Next to it you will see the recommended shutter speed. Example . . . 11 indicates a shutter speed of 1/8 second

If your total has a 1/2 in it, use the lower full number. Thus, if the total is 12-1/2, use the figure 12 in table D.

TABLE A Film Type and Film Speed
(ASA equivalent)

Film Types	Speed	
47, 57, 107	3000	1
46-L	800	3
52	400	4
42	200	5
51 (tungsten lighting)	125	6
146-L (tungsten lighting)	100	6
55 Positive/Negative	50	7
Polacolor Types 48, 58, 108 with 80B & CC20B filters	24	8
with 80B & CC40B filters	12	9

TABLE B Reproduction Scale

Reduction	1:10 to 1:5	1
	1:4 to 1:2	2
Same size	1:1	3
Magnification	1.5x	3-1/2
	2x	4
	3x	5
	4x	5-1/2
	5x	6
	6x	6-1/2
	7x, 8x	7
	9x, 10x	8

TABLE C Lens Aperture

f/4.5	1/2
f/5.6	1
f/8	2
f/11	3
f/16	4
f/22	5
f/32	6

When setting the lens between two f-numbers, use half numbers.
Thus, for f/11-f/16 use 3-1/2.

TABLE D Shutter Speeds

Total from A, B, & C	Shutter speed (exposure time)
7	1/125 sec
8	1/60
9	1/30
10	1/15
11	1/8
12	1/4
13	1/2
14	1 sec
15	2
16	6*
17	15*
18	40*
19	1-1/2 min*
20	4 min*

* Compensation for reciprocity failure: Normally, when an exposure meter or exposure chart indicates an exposure of about 4 seconds or longer, the exposure time needed in practice will be longer, due to a lowering of the film's effective sensitivity in low light levels. This effect, known as low light level reciprocity failure, is common to most photographic emulsions. In this guide, table D has a built-in reciprocity failure compensation for the numbers 16 to 20. Reciprocity failure effects tend to vary somewhat from film to film, and the compensation incorporated here are an average for Polaroid Land film types in general. Thus, the times indicated are a rough guide only.

EXPOSURE GUIDE, MP-4 PLUS, TUNGSTEN LAMPS

Find the numbers that correspond to the speed of the film you are using (Table A), the reproduction scale (Table B), and the lens aperture (Table C). Add the numbers, then find the total in Table D. Next to this number is the suggested shutter speed.

TABLE A Film Speed

ISO3000/36°	1
ISO800/30°	3
ISO400/27°	4
ISO200/24°	5
ISO100/21°	6
ISO80/20°	6-1/2
ISO50/18°	7
ISO25/15°	8
ISO3/6°	11

TABLE B Reproduction Scale

1:10 to 1:5	1
1:4 to 1:2	2
1:1	3
1.5X	3-1/2
2X	4
3X	5
4X	5-1/2
5X	6
6X	6-1/2
7X, 8X	7
9X, 10X	8

Measure the length of the original subject and its length on the ground glass to determine the reproduction scale.

Table C Lens aperture

f/4.5	1/2
f/5.6	1
f/8	2
f/11	3
f/16	4
f/22	5
f/32	6

When setting the lens between two f-numbers, use half numbers. Thus, for f/11-f/16, use 3-1/2

Table D Shutter speed

Total from A, B, & C	Shutter speed
7	1/125 sec
8	1/60
9	1/30
10	1/15
11	1/8
12	1/4
13	1/2
14	1 sec
15	2
16	6*
17	15*
18	40*
19	1-1/2 min*
20	4 min*

*Includes compensation for low light level reciprocity failure. This compensation is an average for Polaroid instant films in general, and thus a rough guide only. Note that color films will require filtration in addition to a longer exposure.

EXPOSURE GUIDE - MP-4 PLUS, HALOGEN LAMPS

Find the numbers that correspond to the speed of the film you are using (Table A), the reproduction scale (Table B), and the lens aperture (Table C). Add the numbers, then find the total in Table D. Next to this number is the suggested shutter speed.

Table A Film Speed

ISO3000/36°	1
ISO800/30°	3
ISO400/27°	4
ISO200/24°	5
ISO100/21°	6
ISO80/20°	6-1/2
ISO50/18°	7
ISO25/15°	8
ISO3/6°	11

With color films, adjust the film speed to compensate for filter factors.

Table B Reproduction Scale

1:10 to 1:5	1
1:4 to 1:2	2
1:1	3
1.5X	3-1/2
2X	4
3X	5
4X	5-1/2
5X	6
6X	6-1/2
7X, 8X	7
9X, 10X	8

Measure the length of the original subject and its length on the ground glass to determine the reproduction scale.

Table C Lens aperture

f/4.5	1/2
f/5.6	1
f/8	2
f/11	3
f/16	4
f/22	5
f/32	6

Operation	<i>Polaroid MP4/MP4 Plus</i>
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When setting the lens between two f-numbers, use half numbers.
Thus, for f/11-f/16, use 3-1/2.

Table D Shutter speed

Total from A, B, & C	Shutter speed
7	1/125 sec
8	1/60
9	1/30
10	1/15
11	1/8
12	1/4
13	1/2
14	1 sec
15	2
16	6*
17	15*
18	40*
19	1-1/2 min*
20	4 min*

*Includes compensation for low light level reciprocity failure. This compensation is an average for Polaroid instant films in general, and thus a rough guide only. Note that color films will require filtration in addition to a longer exposure.

SECTION 4

TROUBLESHOOTING

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CAMERA

Problem	Probable Cause	Corrective Action
Pictures out of focus	<ol style="list-style-type: none"> 1. Filmholder not properly seated 2. Camera head not parallel with baseboard 3. Lens not tightened completely in shutter 	<ol style="list-style-type: none"> 1. Seat film holder properly (instruct customer). 2. If camera was used in any position other than vertical, make sure it was returned to vertical alignment slot and locking arm was locked. If the camera is of the rotatable column type, make sure the column locking arm is locked. 3. Tighten lens.
Shutter will not open (or open but will not close) for viewing or picture taking	<ol style="list-style-type: none"> 1. Press focus level on shutter in wrong position 2. Automatic "pre-view" arm not properly engaged by film holder (fixed camera head) 3. "Pre-view" shutter cable improperly adjusted 4. Defective 26 inch "pre-view" shutter cable 5. Lock screw on 10 inch shutter cable too tight 6. Defective 10 inch shutter cable 7. Defective shutter 8. Defective automatic "pre-view" actuating mechanism 	<ol style="list-style-type: none"> 1. Position press focus lever to front. 2. Reseat film holder on holder adapter, making sure it engages "pre-view" actuating arm. 3a. Adjust cable at attachment point to automatic "pre-view" mechanism until approximately 1/8 inch clearance exists between cable end and mechanism with a film holder installed. 3b. Adjust flat end of "pre-view" cable so the lug on the sliding camera head contacts it approximately 5/8 inch from end of slider right hand travel. 4. Replace cable. 5. Loosen lock screw. 6. Replace cable. 7. Repair or replace shutter. 8. Repair or replace actuating assembly.

<p>Pictures are light struck in one area</p>	<ol style="list-style-type: none"> 1. Improperly seated 4 x 5 film holder 2. Unlocked or improperly seated film holder adapter or sliding camera head 3. Improperly seated pack or roll film back 4. Damaged bellows 5. Failure to completely close dark slide before removing film holder from camera 6. Screws loose on film pack holder base 7. Film holder retainer springs weak or broken 8. Missing or deformed light seal gaskets 9. Dark slide removed from film back 10. Shutter not closing fully 11. Outside light reflecting off subject 12. Sliding head deformed 	<ol style="list-style-type: none"> 1. Reseat film holder on film holder adapter (instruct customer.) 2. Reseat and lock film holder adapter or sliding camera head. 3. Reseat pack or roll film back. 4. Replace bellows. 5. Make sure dark slide is fully closed before removing the film holder from the camera. 6. Tighten screws on film pack holder base. 7. Replace retainer springs. 8. Replace gaskets. 9. Replace dark slide. 10. Check for defective "pre-view" shutter cable and/or "pre-view" actuating mechanism. If defective, replace. If OK, repair or replace shutter. 11. Locate and block off source of reflected light (i.e., window, overhead lights, etc.). 12. Repair or replace.
<p>Shutter fails to open with film holder removed from adapter of fixed head or with slider too far left on sliding head</p>	<ol style="list-style-type: none"> 1. Shutter release and "pre-view" shutter cables reversed on shutter 2. Defective or deformed "pre-view" shutter cable or "pre-view" actuating mechanism 3. Defective shutter 	<ol style="list-style-type: none"> 1. Reverse cables. 2. Replace cable and/or actuating mechanism. 3. Repair or replace shutter.

	4. Press focus lever on wrong side	4. Move press focus lever to proper position.
Pictures dark on one side	1. Uneven lighting	1. Adjust floodlight arms and floodlights to get more equal illumination over entire baseboard.
Pictures have a dark line along one side	1. Dark slide covering part of negative 2. Sliding head not pushed all the way to the left 3. Film holder not seated properly	1. Position dark slide with approximately 1/4 inch of red stripe exposed. 2. Push head completely to left. 3. Reseat film holder.
No lights, or no power to accessory receptacle	1. Power cord disconnected 2. Lights not corrected properly 3. Main power cord defective 4. Switch defective 5. Circuit breaker defective 6. Circuit breaker tripped	1. Plug in power cord. 2. Connect lights. 3. Replace electrical harness. 4. Replace electrical harness. 5. Replace electrical harness. 6. Reset circuit breaker.
Lamps on one side do not light, or no power to accessory receptacle	1. Defective cord between white switch and lights or between black switch and accessory receptacle	1. Check by plugging lamp cord into alternate power source. If lamps light, this is an indication of a faulty electrical harness in the baseboard, which must then be replaced.
One lamp does not light	1. Lamp defective 2. Receptacle defective 3. Lighting arm cord defective 4. Lamp socket defective	1. Replace lamp. 2. Replace electrical harness. 3. Replace cord. 4. Replace lamp socket.

PACK FILM BACK

Problem	Probable Cause	Corrective Action
Bad spreads	<ol style="list-style-type: none"> 1. Rollers dirty 2. Rollers nicked or scratched 3. Exit door area dirty 4. Tab strip bar broken or missing 5. Roller bushings dirty 6. Roller bushings missing 7. Roller supports bent 8. Spread roll springs bent or missing 9. Edge control bar springs bent or missing 10. Edge control bar bent 	<ol style="list-style-type: none"> 1. Clean rollers (instruct customer). 2. Replace rollers. 3. Clean exit door area. 4. Replace tab strip bar. 5. Clean bushing area. 6. Replace bushings. 7. Replace spider. 8. Replace spread roll springs. 9. Replace edge control bar. 10. Replace edge control bar.
Film tearing	<ol style="list-style-type: none"> 1. Exit door bent (not opening properly) 2. Edge control bar assembly not free 3. Edge control bar bent 4. Slide block defective 5. Tab strip bar broken 	<ol style="list-style-type: none"> 1. Replace exit door. 2. Clean area thoroughly. Replace broken or missing parts. 3. Replace edge control bar. 4. Replace slide block. 5. Replace tab strip bar.

545 (4 x 5) FILM HOLDER

Problem	Probable Cause	Corrective Action
Envelope pulls through	<ol style="list-style-type: none"> 1. Envelope stop latch binding 2. Envelope stop latch missing 3. Early style envelope stop latch 4. Linkage out of adjustment 5. Film packet inserted backwards 6. Film defective 	<ol style="list-style-type: none"> 1. Check if latch or yoke is bent. If either is defective, replace it. 2. Replace. 3. Replace with new design latch. 4. Adjust linkage. 5. Instruct customer on proper loading techniques. 6. Try new film.
Negative cap does not release (can't pull negative out)	<ol style="list-style-type: none"> 1. Negative cap stop out of adjustment 2. Negative cap stop defective 3. Film defective 	<ol style="list-style-type: none"> 1. Adjust linkage. 2. Replace. 3. Try new film.
Negative cap not holding (complete film packet pulls through)	<ol style="list-style-type: none"> 1. Negative cap stop binding 2. Linkage out of adjustment 3. Negative cap squeezed closed 4. Negative cap stop missing 	<ol style="list-style-type: none"> 1. Check if latch or yoke is bent. If either is defective, replace it. 2. Adjust linkage. 3. Spread apart negative cap so it will catch. 4. Replace stop.
Negative cap hanging up in roller area	<ol style="list-style-type: none"> 1. Envelope stop latch defective 2. Envelope stop latch does not lie flat when unit is on "process" 3. Defective film 	<ol style="list-style-type: none"> 1. Straighten or replace the latch. 2. Adjust linkage. 3. Try new film.
Poor picture quality	<ol style="list-style-type: none"> 1. Dirty rollers 	<ol style="list-style-type: none"> 1. Clean rollers (instruct customer).

Uneven spreads	<ol style="list-style-type: none">1. Eccentric cam defective2. Spring loading rod worn3. Customer depressing roller spring while processing4. Roller spring defective5. Roller(s) defective (not concentric or missing bearings)6. Loading link reversed7. Dirty rollers	<ol style="list-style-type: none">1. Replace2. Replace3. Instruct customer on proper processing instructions.4. Replace5. Replace roller(s).6. Position link correctly.7. Clean rollers (instruct customer).
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SECTION 5

REPAIR AND ADJUSTMENTS

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INTRODUCTION

This section of the manual provides step-by-step procedures designed to aid in the repair and adjustment of MP-4 assemblies. Although not every possible problem is covered, these procedure cover the most likely and highest frequency problems.

NOTE

The MP-4 was manufactured using metric system fasteners (nuts, screws, etc.). You will need metric tools to work on the unit. To improve their seating in screw heads, grind down the tops of Phillips-head screwdrivers slightly. If any touchup work is needed, be sure to use the proper Polaroid paint.

A. LIGHTING SYSTEM

1. Replacement of Main Electrical Harness

NOTE

The components on the main electrical harness are potted. Therefore if any component (switch, circuit breaker, etc.) fails, the complete harness must be replaced.

a. Removal

- 1) Remove the camera head from the carriage and remove the column from the baseboard (if an XLR model). On standard model, remove the camera head and tip the column down to horizontal to gain access to the harness.
- 2) Remove the 12 screws securing the switch and electrical outlet boxes to the baseboard (four from each box).
- 3) Remove the harness from the baseboard.

b. Installation

- 1) Position the new harness on the baseboard and secure its outlet boxes with the 12 screws.
- 2) If XLR model, replace the column on the baseboard and the camera head on the carriage. If standard model, tip the column back up to vertical and replace the camera head.

2. Replacement of Illuminating Lamp Assemblies

NOTE

Because of the time required and resulting cost, individual lamp sockets and/or cords should not be replaced. If a socket cord is defective, the entire assembly should be replaced.

a. Removal

- 1) Disconnect the lamp power cord from its baseboard outlet.
- 2) Loosen the knurled knob on the top of the lamp reflector and slide the assembly off the support arm.

b. Installation

To install the new lamp assembly, reverse steps 1 and 2 above.

3. Replacement of Light Arms

a. Removal

- 1) Remove the lamp assemblies and cross bar from the light arm and lower the light arm to table top level.
- 2) With an Allen wrench, loosen the lock screw holding the light arm bolt.

NOTE

The lock screw is located on the top side of the right-hand light arm frame and on the bottom side of the left-hand frame.

- 3) Using a large wide bladed screwdriver, unscrew the bolt from the light arm locking handle (figure 5-1).

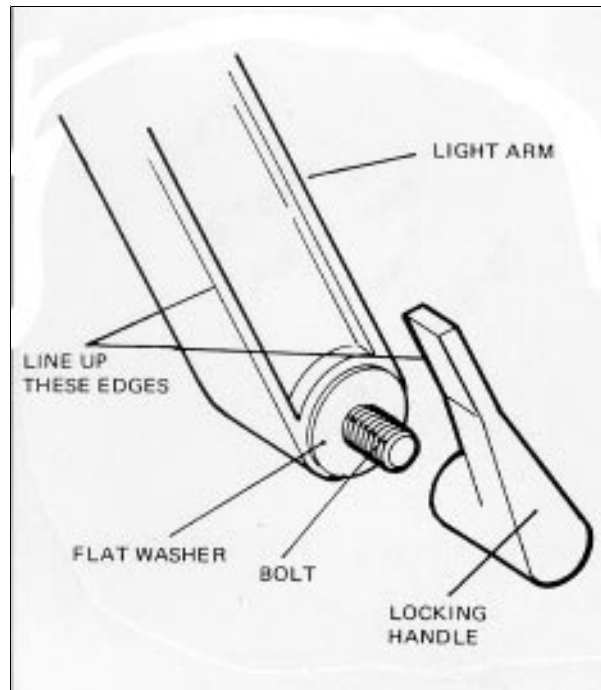


Figure 5-1. Aligning Light Arm and Locking Handle

- 4) Remove the locking handle and flat washer from the bolt.
 - 5) Slide the arm off the bolt, being careful not to lose the anti-friction serrated washers.
 - 6) Remove the bolt from the frame.
- b. Installation
- 1) Slide the bolt into the light arm mounting frame.
 - 2) Install one serrated washer on the mounting frame with the tangs seated in its slots and one serrated washer on the arm with the tangs seated in its slots.
 - 3) Slip the light arm onto the bolt with the serrated side of the arm washer facing the serrated side of the frame washer.
 - 4) Replace the locking handle flat washer onto the bolt and position the locking handle over the threaded end of the bolt.

NOTE

To insure that the locking handle will function properly, it must be aligned so that the finger portion is on the same place as the light arm (figure 5-1).

5) Screw the bolt into the locking handle until a slight resistance is felt when the light arm is moved.

6) Using an Allen wrench, tighten the light arm lock screw.

7) Rotate the locking arm to the locked position and check to make sure the light arm will not move when locked.

B. COLUMN ASSEMBLY***1. Replacement of Columns*****CAUTION**

When removing a defective column, be sure to support it properly to prevent its accidental falling.

a. Removal**Standard Model**

- 1) Remove the bellows assembly from the carriage.
- 2) Remove the carriage assembly from the column (see paragraph C1).
- 3) Carefully tilt the baseboard and column assembly to gain access to the hardware under the baseboard.
- 4) While clamping the nuts under the baseboard, unscrew four Phillips-head screws from the column mounting plate on top of the baseboard. Remove the column.

XLR Model

- 1) Remove the bellows assembly from the carriage.
- 2) Remove the carriage assembly from the column (see paragraph C).

- 3) Loosen the locking lever on the column mount and lift the column off the post.
- 4) Carefully tilt the baseboard and column assembly to gain access to the hardware under the baseboard.
- 5) While clamping the nuts under the baseboard, unscrew four Phillips-head screws from the column mounting plate on top of the baseboard. Remove the column.

b. Installation

Standard Model

- 1) Position the column on the baseboard with the height scale facing forward.
- 2) Align the mounting holes on the column with those on the baseboard and secure the two units using four Phillips-head screws and nuts.
- 3) Install the carriage assembly on the column and replace the balancer assembly.
- 4) Install the bellows assembly on the carriage.

XLR Model

- 1) Position the column on the baseboard with the unpainted section of the base toward the front.
- 2) Align the mounting holes on the column with those on the baseboard and secure the two units using four Phillips-head screws and nuts.
- 3) Remove the column on the post and secure it with the locking knob.
- 4) Install the carriage assembly on the column and replace the balancer assembly.
- 5) Install the bellows assembly on the carriage.

2. Replacement of Column Scale - Standard Model

a. Removal

- 1) Remove the bellows assembly, the balancer assembly, and the carriage from the column.
- 2) Lay the main column on the horizontal surface with the baseboard in a vertical position.
- 3) Remove the four base mount bolts, using the special wrench provided with the MP-4, and remove the baseboard from the column.
- 4) Using a knife, lift one end of the scale and peel the remainder of the scale from the column.
- 5) Remove all old glue from the column.

b. Installation

- 1) Peel a couple of inches of the protective backing from the new self-adhering scale, starting at the printed end of the scale.
- 2) Align the base of the scale flush with the base of the column and align the remainder of the scale to stay within the column rails. Press the peeled end of the scale into contact with the column.
- 3) Peel off the remaining protective backing and press the scale into place, working from the bottom to the top of the column.

CAUTION

Be very careful to keep the scale within the rails and make sure that no air bubbles form as you work up the column.

- 4) Trim off any excess scale that extends beyond the top of the column.
- 5) Reassemble the column on the baseboard.
- 6) Install the carriage, the balancer assembly, and the bellows assembly onto the column.

3. Replacement of Column Scale - XLR Model

a. Removal

- 1) Remove bellows assembly from the vertical carriage.
- 2) Remove the balancer assembly.
- 3) Remove the carriage from the main column.
- 4) Loosen the main column locking arm, lift the column from the baseboard, and place the column on the horizontal surface with the scale facing up.
- 5) Using a knife, lift one end of the scale from the column and peel the scale off.
- 6) Remove all old glue from the column.

b. Installation

- 1) Peel a couple of inches of protective backing from the new self-adhering scale, starting at the printed end of the scale.
- 2) Align the base of the scale flush with the base of the column and align the remainder of the scale to stay within the column rails.
- 3) Press the peeled end of the scale into contact with the column.

CAUTION

Be very careful to keep the scale within the rails and make sure that no air bubbles form as you work up the column.

- 4) Trim off any excess scale that extends beyond the top of the column.
- 5) Replace the column on the baseboard and tighten the column locking arm.
- 6) Replace the carriage on the main column.
- 7) Replace the balancer assembly.
- 8) Replace the bellows assembly on the carriage.

C. CARRIAGE ASSEMBLY

1. Replacement of Carriage Assembly

a. Removal

- 1) Remove the bellows assembly from the carriage.
- 2) Loosen the carriage locking arm and raise the carriage to the top of the column, until it butts against the balancer assembly. Lock the carriage.
- 3) Unscrew the upper left carriage locking pin which holds the balancer spring to the carriage.
- 4) Remove the balancer assembly from the top of the column.
- 5) Unlock the carriage and slide it up and completely off the column. (It may be necessary to rotate the height adjustment knob to get the carriage off the column.)

b. Installation

- 1) Position the carriage assembly over the column and slide it about halfway down the column. Lock it there.
- 2) Set the balancer assembly firmly in place on top of the column.
- 3) Unlock the carriage and slide it up the column to butt against the balancer. Lock it there.
- 4) Capture the left balancer spring in the carriage using the left locking pin.
- 5) Lower the carriage to a comfortable working position and install the bellows assembly.

2. Disassembly/Reassembly - Carriage Assembly

Figure 5-2 shows the carriage assembly removed from the column. Refer to paragraph C1 for instructions on carriage removal from the column.

a. Disassembly

- 1) Remove the bellows adjustment locking lever by unscrewing it in a counterclockwise direction and at the same time removing the bolt and the lock washer.
- 2) Remove the body mounting frame by unscrewing four Phillips-head screws from inside the carriage.
- 3) Remove the click adjusting plate and the rotational scale from the body mounting frame by removing two Phillips-head screws, one from each side of the frame.

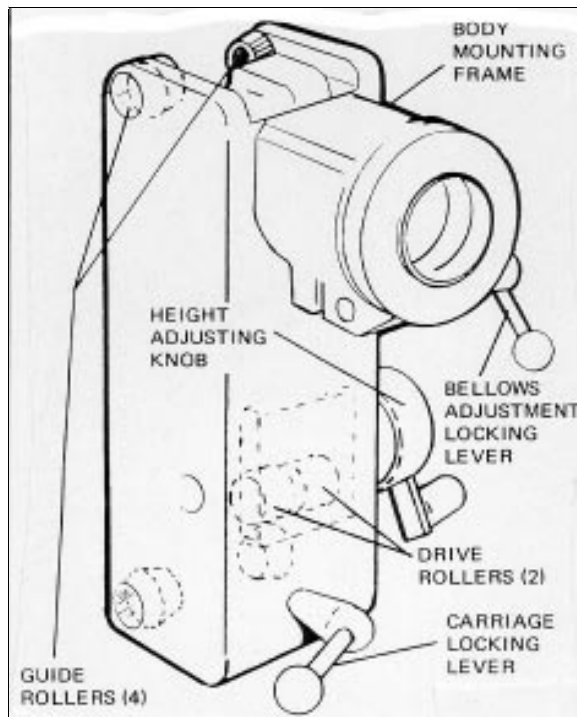


Figure 5-2. Carriage Assembly

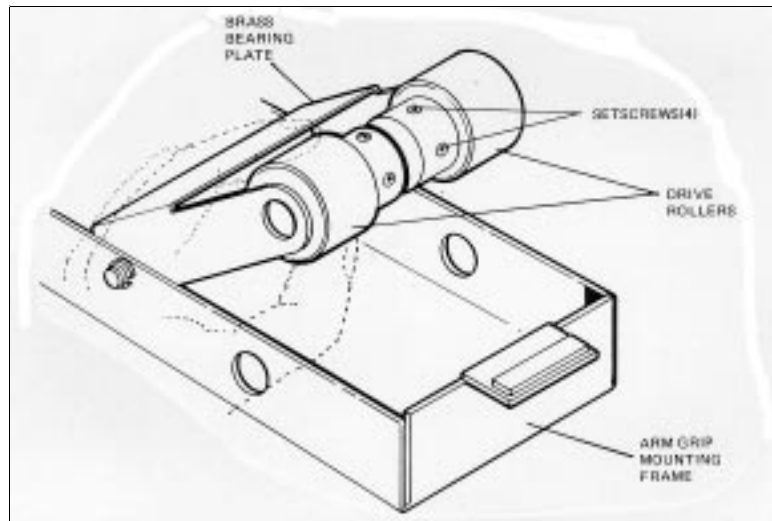


Figure 5-3. Removing the Drive Rollers

- 4) Inside the carriage frame, loosen the four set-screws holding the height adjusting knob shaft to the drive rollers (figure 5-3). Pull the knob and shaft free of the rollers.
- 5) Pivot roller assembly as shown in figure 5-3 and remove the drive rollers from the brass bearing plate.
- 6) Remove the arm grip mounting frame by removing four Phillips head screws and washers which secure it to the casting.
- 7) Remove each of the lower guide rollers as follows (figure 5-4):

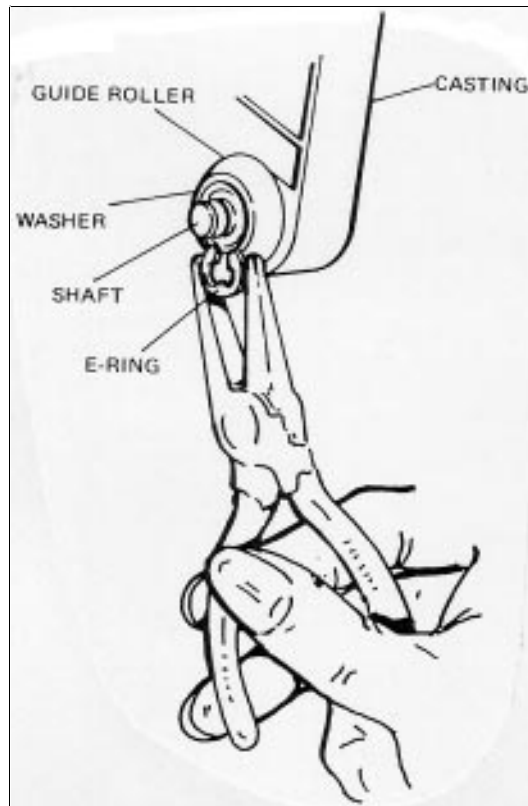


Figure 5-4. Removing the Lower Guide Rollers

Pry off the E-ring securing the roller to the shaft.

Gently drive the shaft out of the casting by tapping it from the inside. The shaft head will push the cover out of the casting and the roller and washer will fall off the shaft.

8) Remove each of the upper guide rollers as follows:

Drive a prick punch through the cover in the casting and pry the cover free (figure 5-5).

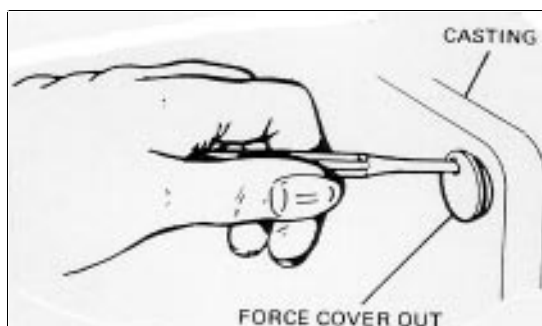


Figure 5-5. Removing Upper Guide Roller Cover Plate

Using special tools #11750 and #11763 with socket #11764, remove the nut and lock washer holding the roller assembly bolt to the casting (figure 5-6).

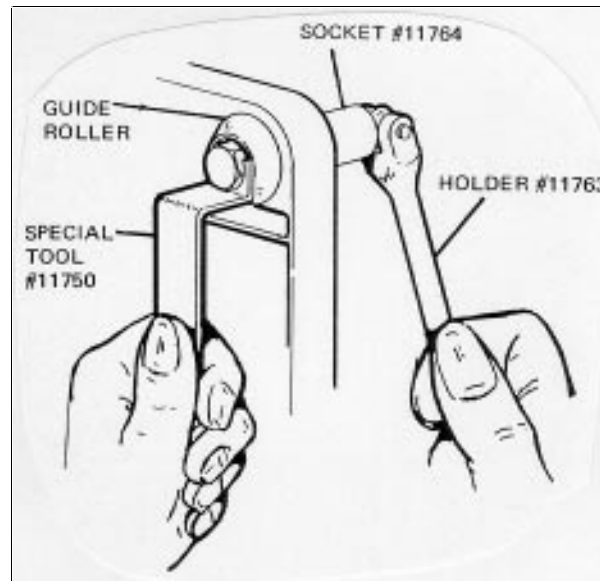


Figure 5-6. Removing Upper Guide Rollers

Slide the bolt with the roller out of the casting and remove the bolt from the roller.

b. Reassembly

1) Lightly lubricate the roller tension spring on the arm grip mounting frame with Dow-Corning D-55 Lubricant (figure 5-7).

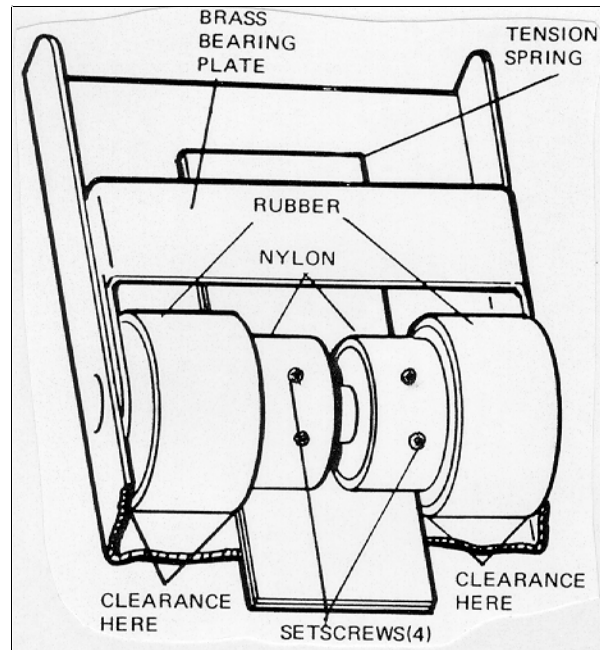


Figure 5-7. Correct Position of Drive Rollers

- 2) Lift the brass bearing plate and insert the rollers. Lower the bearing plate and rollers, making sure that only the nylon portion of the rollers contact the tension spring. Rotate the rollers so the setscrews are facing up (figure 5-7).
- 3) Apply strong pressure to the rollers and insert the height adjusting knob shaft through the rollers.
- 4) Adjust the rollers so that only the nylon portion touches the tension spring and the rubber drive rollers do not drag on the brass bearing plate (figure 5-7). Tighten the setscrews.
- 5) Install the click mounting plate and the rotational scale on the body mounting frame with two Phillips-head screws.
- 6) Insert the body mounting frame into the larger hole in the carriage and secure it with four Phillips-head screws and washers.
- 7) Install the upper guide rollers as follows:

Slide the securing bolt through the roller and positioning the two in the mounting hole in the casting (figure 5-8).

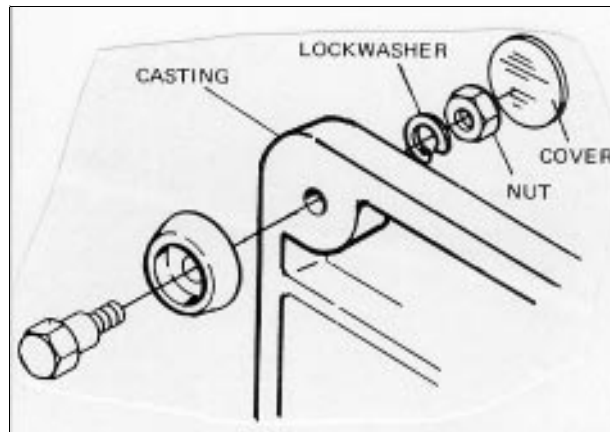


Figure 5-8. Assembling Upper Guide Roller on Carriage

Position the lock washer and nut on the bolt and secure it using special tools #11750 and #11763 with socket #11764.

Install a new cover over the hole in the casting. Apply suitable glue around the edge of the cover before setting it over the hole.

8) Install the lower guide rollers as follows:

Insert the bolt through the casting.

Slide the guide roller over the bolt.

Place a washer on the bolt next to the roller.

Secure the assembly by installing the E-ring on the recess of the bolt (figure 5-4).

Install a cover over the bolt hole in the casting. Apply glue to its edges to secure it to the casting.

9) Install the bellows assembly locking lever on the top right side of the carriage. Insert a bolt through the body mounting frame from the left side. Attach a washer and the lever handle to the bolt and tighten by turning the handle clockwise.

10) Install the carriage assembly locking knob at the bottom of the unit by screwing the knob handle clockwise into the casting.

CAUTION

There are four nylon support guides in the carriage (item 32, figure 5-2, section 5). These are used to prevent side-to-side movement of the assembly as it travels up and down the column. The supports are secured by set-screws and must NOT be touched except in the unusual case of undesired lateral motion.

D. CAMERA HEAD AND BELLOWS ASSEMBLY**1. Replacement of the Bellows****a. Removal**

1) Using a Phillips-head screwdriver, remove the four screws holding the upper part of the bellows to the film holder adapter mount.

2) Using a Phillips-head screwdriver, remove the four screws holding the lower part of the bellows to the shutter mount.

NOTE

Early MP-4 models were manufactured with the bellows glued to the upper and lower mounts. To prevent excessive paint damage, scribe the point where the bellows joins the mounts with an X-acto knife.

3) Remove the bellows.

b. Installation

1) Completely remove all old glue from the bellows mounts. (On newer models, this step is not necessary.)

2) Using either "Elmer's Glue-All" or "UHU Instant All Purpose Glue" (do not use substitutes!) place a thin bead of glue around the top and bottom of the bellows where it will mate with the mounts.

3) Run a double strand of yarn on both glued areas.

NOTE

Allow a minute or two for the glue to partially set up.

4) Position the bellows on the camera head over the shutter mount. Carefully lower the bellows onto the mount and secure it using the four Phillips-head screws.

5) Align the upper portion of the bellows to the film holder adapter mount and secure it there with four Phillips-head screws.

c. Light Leak Test

1) Bring the assembly into a darkroom after the glue has completely dried.

2) Place a small light bulb inside the bellows and carefully examine the bellows-to-mount areas for light leaks.

3) If a small light leak is noted, seal the area with "Permatex #2 Non-Hardening Form-A-Gasket." Use no substitute. Re-examine the bellows. If light is still visible, repeat this entire procedure.

2. Replacement of the Mounting Plate

Refer to figure 6-3 in Section 6 to locate items mentioned in this procedure.

a. Removal

1) Remove the bellows adjustment assembly from the carriage.

2) Remove the six screws holding the mounting plate assembly (figure 5-9) to the bellows frame and remove the mounting plate.

b. Installation

1) Lubricate the pressure leaf spring in the mounting plate with Sow-Corning #D-55 Silicone Lubricant.

2) Position the mounting plate on the bellows frame, making certain that the click pin is positioned toward the top of the plate. **DO NOT TURN THE PLATE UPSIDE DOWN!** Hand tighten the screws holding the assemblies together.

3) Secure the plate to the bellows frame by tightening the four corner screws first and then by tightening the two center screws.

3. Replacement of Focus Drive

a. Removal

- 1) Remove the bellows adjustment assembly from the carriage.
- 2) Remove the bellows assembly mounting plate from the bellows frame.

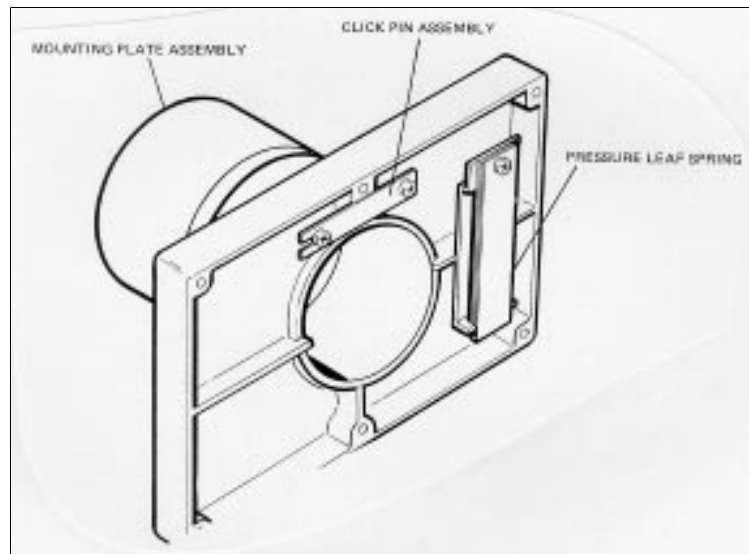


Figure 5-9. Bellows Mounting Plate Assembly

NOTE

Parts installed inside the mounting plate (ie., focus drive shaft pressure plate and positioning detent) are now accessible for replacement if necessary.

- 3) Lift the focus drive shaft (see figure 5-10) and remove the end and intermediate shaft bushings.

NOTE

The end bushing outer surface is round, whereas the intermediate bushing has a flat surface on one side. Each is formed for proper positioning in the bellows frame.

- 4) Slide the drive shaft assembly out of the bellows frame.

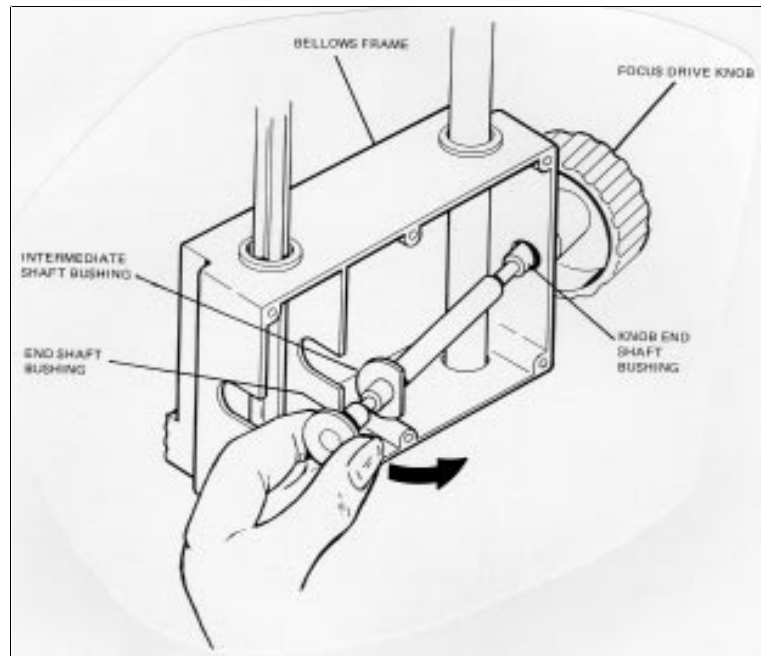


Figure 5-10. Replacing Focus Drive Parts

5) If knob or knob end drive shaft bushing requires replacement, loosen the Allen locking set-screws in the shaft and slip the knob shaft out of the drive shaft. If knob itself needs replacement, loosen the setscrew on the knob and pull it off the shaft.

b. Installation

If knob or knob end bearing have been removed:

- 1) Lubricate the leaf spring where it contacts the bushings with Dow-Corning #D-55 Silicone Lubricant (see figure 5-9).
- 2) Place the drive shaft intermediate and end bearings on the shaft.
- 3) Place the shaft in the bellows frame. Check to make sure the bushings are properly seated.
- 4) Place the knob end bushing on the knob shaft.
- 5) Insert the knob shaft through the side wall opening of the bellows frame and into the end of the drive shaft.

6) Check to make sure the knob is flush with the housing and the drive shaft is engaged with the column. Then tighten the Allen setscrews.

If knob and knob end bushing were not removed:

7) Lubricate the leaf spring where it contacts the bushings with Dow-Corning #D-55 Silicone Lubricant (see figure 5-9).

8) Slide the drive shaft assembly through the side wall opening until the knob is flush to the bellows frame.

9) Install the intermediate and end drive shaft bushings on the shaft.

10) Check to make sure the drive shaft is engaged with the column.

11) Replace the mounting plate.

12) Install the bellows adjustment assembly on the carriage.

4. Replacement of the Focus Scale (Figure 5-11)

a. Removal

1) Locate and remove the Phillips-head screws that secure the vertical slider bar and adjusting bar to the bottom plate. (These screws pass through the bottom plate into the bars. On some units, these screws may be glued in place, requiring extra effort to remove them.)

2) Grasp the upper slide bar and pull the bar assembly free of the bellows frame. The bushings on the bars should be released at this point.

3) Pry the focus scale from the groove in the slider bar.

NOTE

The old scale cannot be reused, so don't spend time trying to salvage it.

4) Thoroughly clean the slider bar, removing all glue from the groove.

b. Installation

1) Apply Elmer's Glue to the groove in the slider bar and position the new focus scale in place. Carefully align the bottom of the scale with the bottom of the slider bar.

2) Press the scale firmly into the groove and wipe off any excess glue. Allow the glue to dry before continuing to the next step.

2) Press the scale firmly into the groove and wipe off any excess glue. Allow the glue to dry before continuing to the next step.

3) Install the slide bar assembly:

Set the two bushings into the opening on top of the bellows frame.

Slide the bars through the bushings.

Install the lower bushings on the adjusting bar.

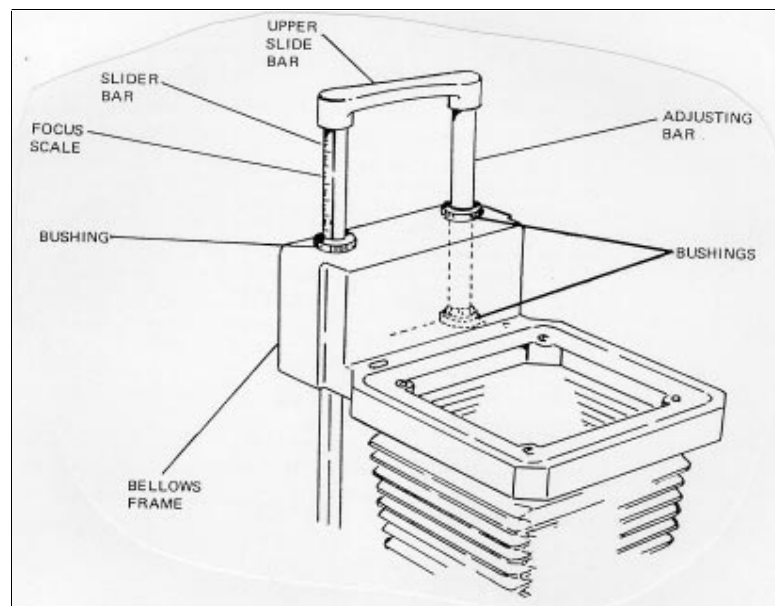


Figure 5-11. Replacement of Focus Scale

4) Secure the bars to the bottom plate using two Phillips-head screws removed earlier.

5. Replacement of Upper Slide Bar (Figure 5-12)**a. Removal**

- 1) Remove the setscrews from the upper slide bar. Remove the screws completely, rather than just loosening them, because the vibrations resulting from the next step might cause them to be lost.
- 2) Using a nylon hammer, gently tap the bar at the two points shown to drive the upper bar free of the vertical bars.

b. Installation

- 1) Align the upper slide bar over the vertical bars and gently tap it down in place, using a nylon hammer.

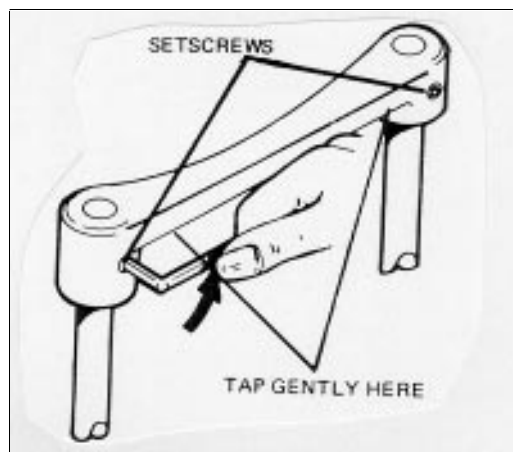


Figure 5-12. Removal of Upper Slide Bar

- 2) Secure the slide bar to the vertical bars using the two setscrews removed earlier.

E. FIXED HEAD CAMERA BACK ASSEMBLY

1. Disassembly/Reassembly of Fixed Head Camera Back

a. Disassembly

- 1) Loosen the hex nuts on the "pre-view" cable (figure 5-13) and release cable from the camera back housing.
- 2) Using a sharp knife, lift one edge of the foam light seal inside the back adapter and peel off the remainder of the seal, removing it from the adapter. Remove all old glue.
- 3) Remove the nine slotted-head screws exposed under the light seal. This separates the camera back from the back adapter.

- 4) Examine the adapter gasket. Remove it if it is damaged. Remove all old glue.

WARNING

Before completing the following step, be aware that the spring under the actuation arm is heavily compressed. It might snap out without warning. Use care to prevent injury.

- 5) Remove the roll pins holding the actuation arm to the camera back by grasping them firmly with a pair of diagonal cutters and prying them out. Remove the actuation arm and actuation spring.

b. Reassembly

- 1) Position the actuation arm next to the camera back and install the left rear roll pin to hold it in place.
- 2) Set the compression spring in position under the actuation arm. Place an awl or small screwdriver through the middle of the spring and butt the spring down against the vertical stop partition on the camera back.
- 3) Compress the spring against the stop while withdrawing the awl or screwdriver and carefully force the compressed spring into its space on the back assembly.
- 4) Secure the compressed spring by pivoting the actuation arm down into position and inserting the second roll pin to hold it in place.
- 5) Lay a thin film of glue on the adapter gasket and position it onto the camera back. Allow the glue to dry before proceeding.
- 6) Secure the back adapter to the camera back using the nine screws removed earlier.
- 7) Place a light film of glue in the area of the nine screws and position a new foam light seal over the glue, pressing it into place. Let the glue dry before continuing.

8) Install the "pre-view" cable on the camera back, straddling the housing slot with the two cable hex nuts. Tighten hex nuts finger tight and perform "Pre-View Cable Adjustment" below.

2. Fixed Head Camera Back Torsion Bar Replacement

a. Removal

- 1) Remove the two Phillips-head screws holding the torsion plate (figure 5-13) and remove the torsion plate.
- 2) Slide the actuation arm about 1/2 inch to the left to permit release of upper and lower torsion bars. Remove the torsion bars.

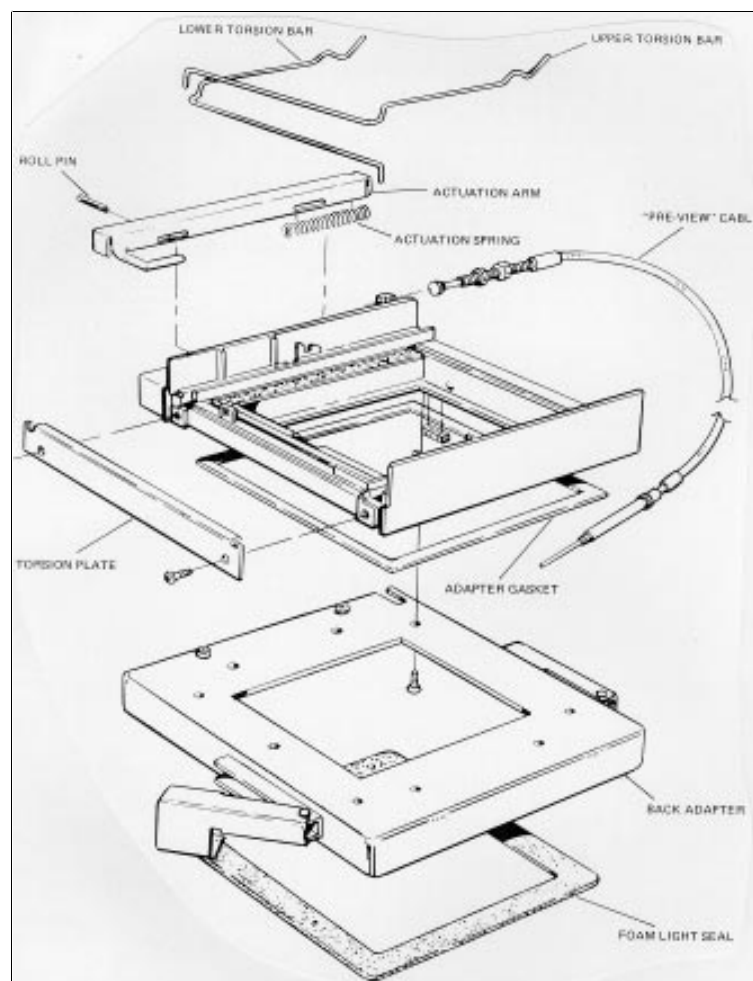


Figure 5-13. Disassembly of Fixed Head Camera Back

b. Installation

- 1) Install the lower torsion bar onto the camera back by first pushing the actuation arm to the left, then sliding the bar into position from left to right.
- 2) Place the upper torsion bar in position over the lower bar and firmly press it down.
- 3) Orient the torsion plate over the two bars and firmly push it against the torsion bars to compress them. While pushing, align the mounting holes in the plate with the camera back holes. Secure the plate with two Phillips-head screws, tightening them alternately to apply even pressure to the bars.

3. Fixed Head Camera Back Felt Light Seal Replacement (figure 5-14)**a. Removal**

- 1) Remove the "pre-view" shutter cable.

NOTE

To gain access to the upper and end felt strips in the camera back, slide the "pre-view" shutter cable actuator in the direction shown and wedge it in that position.

- 2) Pry the defective felt seal loose at one end with a sharp knife and then peel the seal away from the film holder frame.

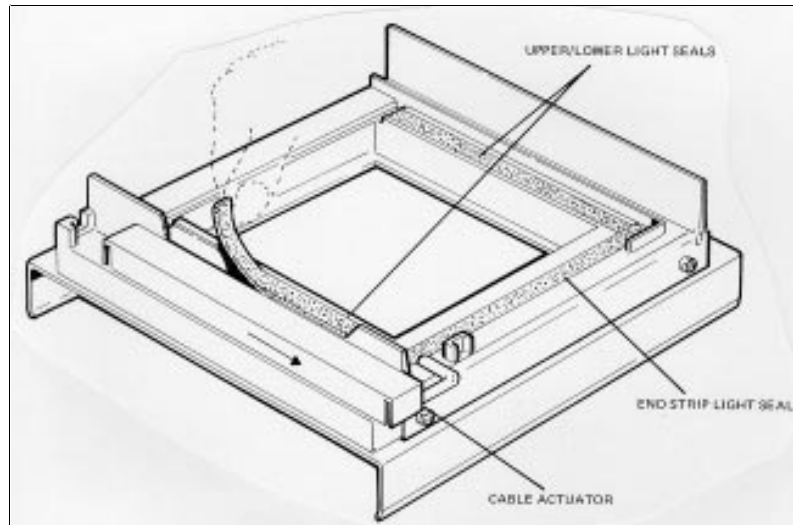


Figure 5-14. Replace Felt Light Seals

- 3) Remove any old glue left on the frame.

b. Installation

1) Apply a thin film of glue to the felt seal channel of the film holder adapter.

NOTE

The upper and lower felt strips are identical, but the end strip is shorter.

2) Select the proper strip and press it into place in the felt seal channel.

NOTE

Let the glue "air dry" for a few minutes before inserting a film holder onto the film holder adapter.

3) Install the "pre-view" shutter and adjust it according to the "Pre-View Cable Adjustment" procedure.

4. "Pre-View" Cable Adjustment (figure 5-15)

a. Install a film holder in position on the camera back.

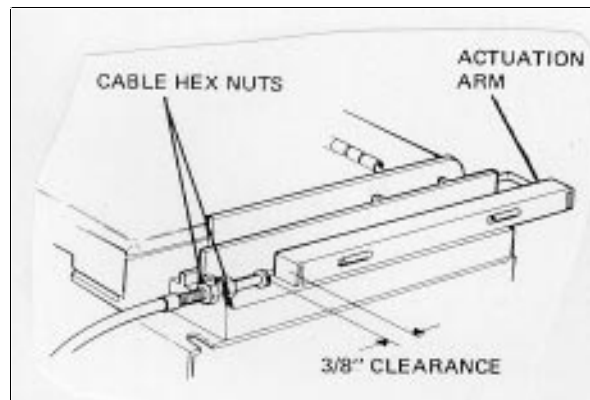


Figure 5-15. "Pre-View" Cable Adjustment

b. Turn the cable hex nuts up or down to obtain the 3/8 inch dimension shown in figure 5-15. When this dimension is obtained, tighten the hex nuts finger tight.

c. Remove the film holder and check to see if the shutter opens fully.

d. Slide the actuation arm to the left (simulating insertion of a film holder) and check to see if the shutter closes fully.

e. Install and remove the film holder two or three times to check "pre-view" cable operation. If it down not operate properly, readjust the cable as directed in paragraph b immediately above.

f. When you are satisfied that the "pre-view" cable is working properly, tight the cable hex nuts. Use care not to strip the threads on the cable. Use only sufficient pressure snug the nuts against the housing slot.

F. SLIDING HEAD CAMERA BACK ASSEMBLY

1. Disassembly/Reassembly of Sliding Head Camera Back (figure 5-16)

a. Disassembly

1) Remove the front panel by removing four screws which secure it to the slide assembly.

2) Separate the slide carriage housing from the slide assembly by removing four screws and lock washers. Then slide the carriage housing to the left to separate it form the slide assembly.

3) Remove the front slide assembly by removing the two screws and hex head nuts that hold it to the frame.

4) Remove the rear slide assembly by removing the two screws and hex head nuts that hold it to the frame.

5) At this point, either of the camera back subassemblies may be removed. Four screws hold each of the subassemblies to the frame. To remove the subassemblies, the light seal must be destroyed to gain access to the mounting screws.

6) Disassemble the camera backs according to the instructions contained in "Disassembly/Reassembly of Fixed Head Camera Back."

NOTE

When removing any of the light seals, be certain that all old glue is removed from metal or plastic parts. When installing new light seals, use glue sparingly and wipe up any excess. Position the new seals in the same orientation as the ones removed.

b. Reassembly**NOTE**

Before assembly the parts, inspect all plane surfaces of the sliding head to be certain that they are true and level. If any distortion is noted, replace the part.

1) Assemble the camera backs according to the instructions in "Disassembly/Reassembly of Fixed Head Camera Back."

2) Install the camera backs on the frame (open end of torsion bars facing the outside) using four retainer screws on each back. Install a new light seal on the bottom of the frame, to cover the screw heads. Allow the glue to dry before continuing.

3) Install the rear slide assembly on the frame using two screws and hex head nuts. Note that the screws are inserted from inside the frame through the slide.

4) Install the front slide assembly on the frame using two screws and hex head nuts. Note that the screws are inserted from inside the frame through the slide.

5) Assemble the slide carriage housing and the slide assembly as follows:

Slide the lower carriage housing onto the upper slide assembly from the left side.

Align the mounting holes on the sides of the two assemblies.

Secure the assemblies using four screws and lock washers (two on each side).

6) Install the front panel using four screws to secure it to the slide assembly.

7) Complete the "Adjustment of Sliding Head Camera Back," "Light Leak Adjustment," and "Adjustment of Pre-View Shutter Cable" procedures which follow.

c. Adjustment of Sliding Head Camera Back

- 1) Install the sliding head assembly on a macro extension unit which, in turn, is secured on a work bench.
- 2) Place the rubber tip of force gauge #11616 against the center of the right-hand camera back subassembly as shown in figure 5-17.
- 3) Push the gauge to the left while observing the pressure readout on the meter. The reading must be between 3 and 7 pounds.
- 4) If the reading is 7 or more, tighten the four adjustment screws which control the pressure required to move the camera back on the slide.

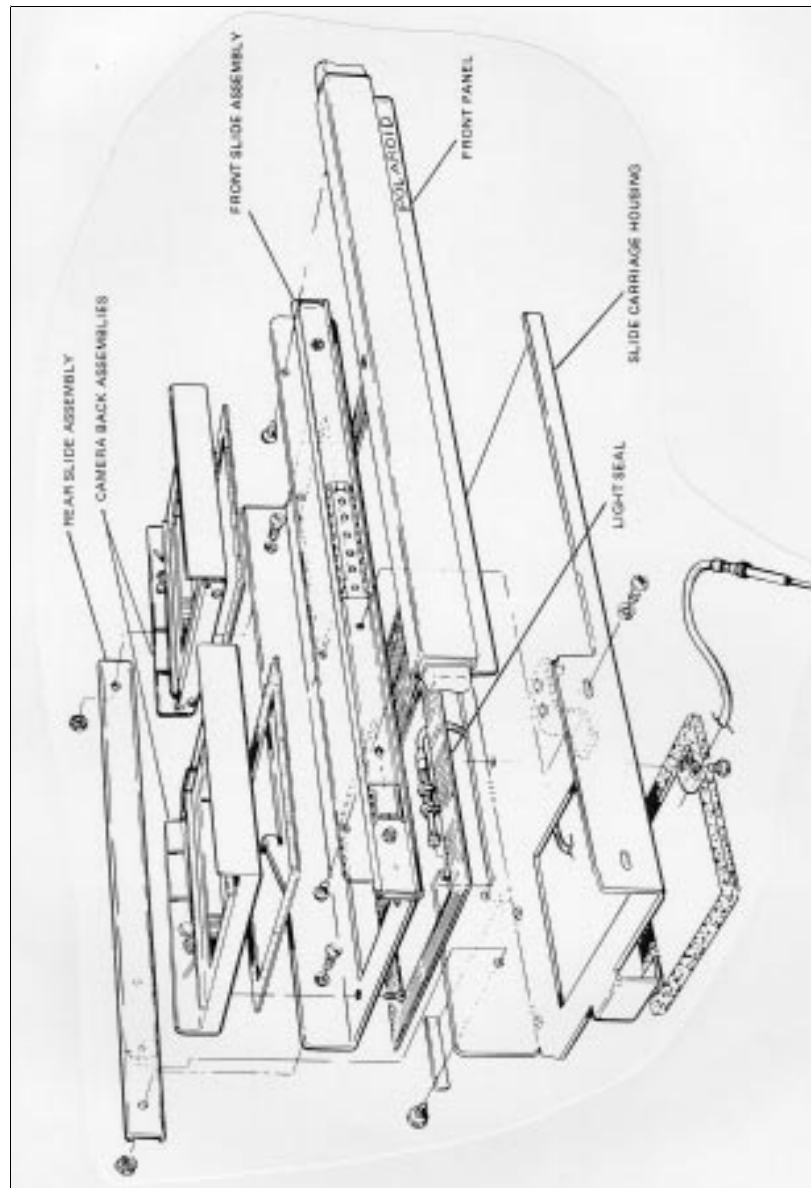


Figure 5-16. Sliding Head Camera Back

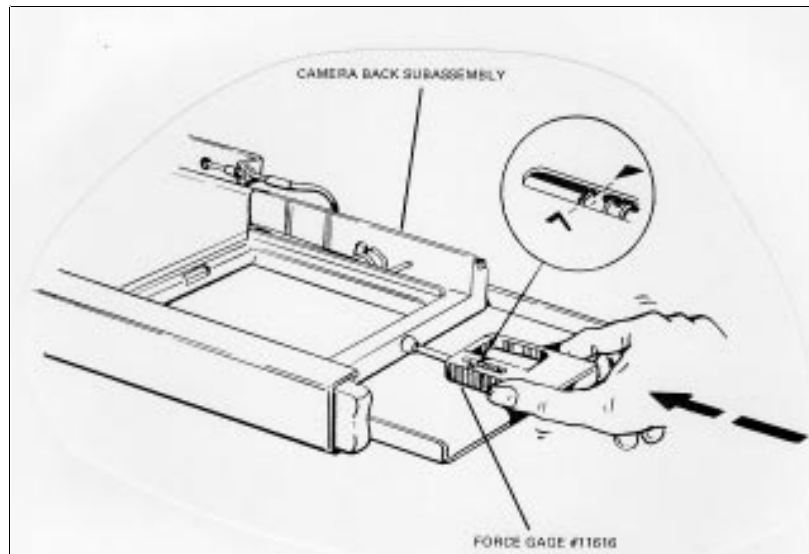


Figure 5-17. Measuring Sliding Head Force Pressure

NOTE

These screws are located on the left end of both slides. Tighten the two screws at the ends of the slides first. Then apply a slight downward pressure on the extreme left end of the mounting plate and tighten the other two screws securely.

5) Now place the gauge against the left side of the camera back and push it to the right while observing the pressure readout on the meter. The reading must be between 3 and 7 pounds.

NOTE

This test should be considered a trial and error effort. It maybe necessary to measure the pressure required to slide the camera back several times. It may also be necessary to alternately tighten and loosen the adjustment screws until a satisfactory reading is obtained in both directions.

d. Light Leak Adjustment

NOTE

If a light leak problem with the sliding head occurs, remove the front panel and complete this procedure.

1) Determine if the light leak occurs on the right side of the film holder adapter with the camera head at its full left position. If it does:

Loosen the screws which are farthest to the right (one on each side of the housing).

Lift the left side of the sliding head to apply a slight pressure on the assembly and retighten the two screws just loosened.

2) Determine if the light leak occurs on the left side of the film holder adapter with the camera head at its full left position. If it does:

Loosen the screws which are farthest to the left (one on each side of the housing).

Press down slightly on the left side of the sliding head and retighten the two screws just loosened.

3) Determine if the light leak occurs with the sliding head at its full right position. If it does, this is an indication that either the slide housing assembly or the mounting plate assembly is distorted and must be repaired or replaced. Also examine the condition of the light seal on the bottom of the mounting plate.

4) When the light leak problem is tracked down and corrected, reinstall the front panel assembly.

e. Adjustment of "Pre-View" Shutter Cable

1) Refer to figure 5-18. Set locknut "a" about 1/8 inch from the end of the threaded cable housing. Open locknut "b" enough to let the two locknuts straddle the slotted bracket.

2) Slide the cable over the slotted bracket and finger tighten the two locknuts.

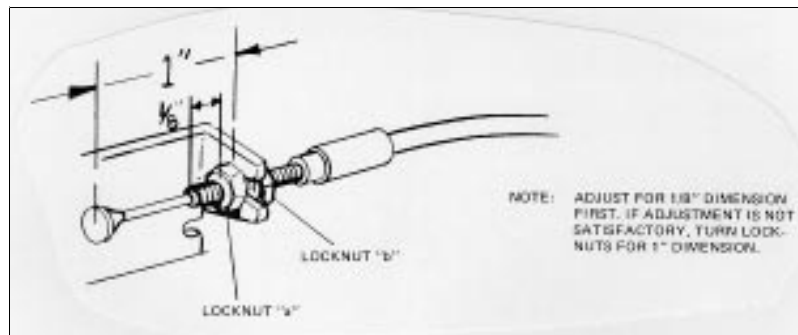


Figure 5-18. Adjusting the "Pre-View" Shutter Cable (Sliding Camera Head)

3) Loosen the lower cable bracket on the bottom of the mounting plate and pull the cable up to create some slack between the slotted bracket and the lower bracket. Retighten the lower bracket.

CAUTION

Do not force the carriage in the next step.

4) Screw the other end of the cable into the shutter socket.

5) Slide the camera head fully to the right. The carriage should lock and the shutter should be wide open.

6) If the carriage will not lock or if the shutter does not open fully when the head is full right, turn the locknuts to get the one-inch dimension show in figure 5-18.

7) Re-examine the carriage locking action and the shutter action. When the adjustment is satisfactory, firmly tighten the cable locknuts.

G. REFLEX VIEWER ASSEMBLY

1. Lens and Mirror Replacement

a. Removal

1) Remove the viewer hood by grasping it at the nose opening and applying a strong upward pressure while rotating it out of the viewer.

2) Using a Phillips screwdriver (while holding the speed nuts with fingertips) remove the two screws holding the lens to the viewer base.

CAUTION

Support the lens to prevent it from dropping into contact with the reflex mirror. The mirror can be scratched or broken if the lens drops on it.

3) Lift the viewer lens and bezel out of the viewer base.

NOTE

The reflex mirror is not normally removed. However, a defective mirror can be replaced as follows:

- 4) Rotate the viewer pivot base to the full-down position.
- 5) Using a long screwdriver or chisel, break the glue bond between the mirror back and the viewer body.
- 6) Lift the mirror out of the viewer body.

CAUTION

If the mirror should break during removal, make sure all fragments are cleaned out of the viewer body.

- 7) Remove old glue from mirror contact points in the viewer body.

b. Installation

- 1) Apply glue to the three mirror contact points of the viewer body.
- 2) Place the mirror in position in the viewer body, being careful that it is flush with the body at the lens end and equidistant from each side of the body.

NOTE

Make sure that the mirror's first surface is facing the lens end.

- 3) Rotate the viewer pivot base to the full-up position to insure that it clears the mirror at all points.

NOTE

Allow the glue to dry before proceeding.

- 4) Insert the screws in the lens bezel and place the bezel on a level surface in the face-down position.
- 5) Set the lens into the lens bezel.
- 6) Place the viewer body on the lens bezel and start the speed nuts onto the screws.

7) Holding the lens in position, rotate the viewer body onto its side and tighten the two screws to secure the assembly.

NOTE

Remove finger marks from the lens and mirror by wiping them gently with a soft, lint-free cloth at completion of assembly.

8) Install the viewer hood by grasping it at the nose opening, engaging the upper lip on the upper lens bezel projections and then rotating the bottom lip into engagement with the lower lens bezel projections.

2. Replacement of Viewer Pivot Base Parts

a. Removal

1) Using a scribe, remove the viewer pivot pin tinnerman nuts.

2) Slide the pivot pins out of the viewer body while holding the pivot base to prevent it from dropping onto the reflex mirror.

NOTE

The two cork pivot pin washers will fall out when the pins are removed. **DO NOT LOSE THEM!**

3) Using a sharp bladed knife, peel the cork friction plates from the pivot base.

4) Scrape any remaining glue off the pivot base.

b. Installation

1) Apply a film of glue to the new cork friction plates.

2) Position the friction plates on the viewer pivot body.

NOTE

Let the glue set up for a few minutes before reassembling the pivot body to the viewer base.

3) Position one of the cork washers over the hole in the pivot base and slide the base into position on the viewer body. When the base hole lines up with the body hole, drop the pivot pin through and secure it with a tinnerman nut.

4) Turn the viewer over and position the second cork washer between the base hole and the body hole. When they are lined up, drop the second pivot pin through and secure it with a tinnerman nut.

H. FOCUSING SCREEN GROUND GLASS REPLACEMENT

NOTE

There are four different types of focusing screens used with the MP-4 system. When replacing the damaged ground glass, be certain that the replacement is the same type as the damaged glass.

1. Removal

a. Using a small bladed screwdriver, remove the four screws securing the glass retainer springs and remove the springs.

b. Lift out the ground glass target and the Fresnel lens. Note the position of these units before removing them from the frame. Especially note that the smooth side of the Fresnel is toward the camera lens.

NOTE

Unless they are damaged, do not remove the rubber target alignment pads. If they are damaged and must be removed, be sure to remove all old glue from inside the frame.

2. Installation

NOTE

If the rubber pads were removed, apply glue to the bottom of the new pads and press them into position inside the frame. Allow a few minutes for the glue to dry before continuing.

a. Position the Fresnel with the smooth side down and install it, firmly seating it in the frame.

- b. Orient the ground glass with the frosted side facing the camera lens. Note the alignment arrowhead on the glass (figure 5-19). This arrow must be pointing to the right, as shown in the illustration, when the glass is installed.

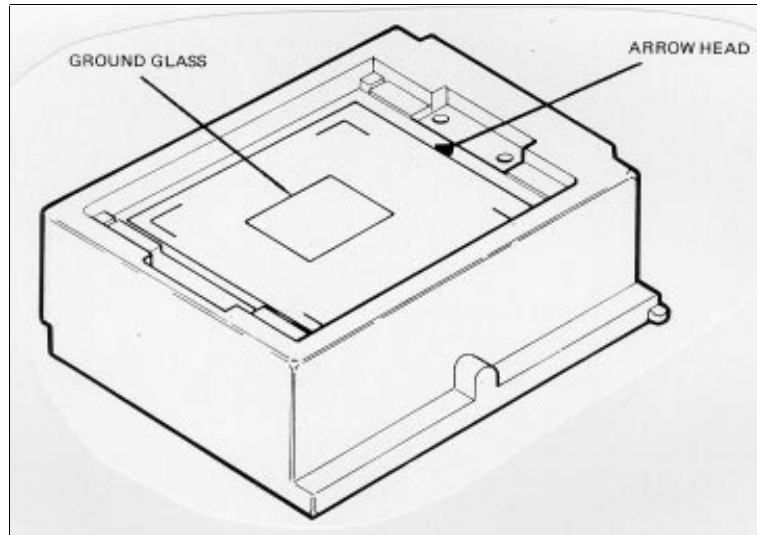


Figure 5-19. Replacement of Ground Glass

- c. Set the glass into the frame, over the Fresnel. Be sure the glass and the Fresnel are aligned within the frame.
- d. Secure the assembly by replacing the glass retainer springs with the retainer screws.

I. REPLACEMENT OF SHUTTER BOARD

1. Removal

- a. Remove the shutter board assembly from the camera head and bellows assembly.
- b. Remove the lens.
- c. Disconnect the "pre-view" shutter release cable from the shutter.



Figure 5-20. Removing Shutter Board Retaining Ring

- d. Remove the 10-inch shutter release cable from the shutter.
- e. Using lens wrench #11043, unscrew the shutter board retaining ring (figure 5-20).

2. Installation

- a. Position the shutter board on the shutter.

NOTE

There is a locating pin on the shutter and a locating notch on the shutter board. The pin must be located in the notch.

- b. Screw the shutter board retaining ring onto the shutter, finger tight, then tighten with lens wrench #11043.
- c. Install the 10-inch shutter release cable in the cable mount on the left side of the shutter (as viewed in the mounted position).
- d. Install the 26-inch "pre-view" shutter release cable in the cable mount on the right side of the shutter (as viewed in the mounted position).
- e. Install the lens.

f. Install the shutter board onto the camera head and bellows assembly.

NOTE

Align the smallest of the three tabs on the board with the smallest notch in the camera head.

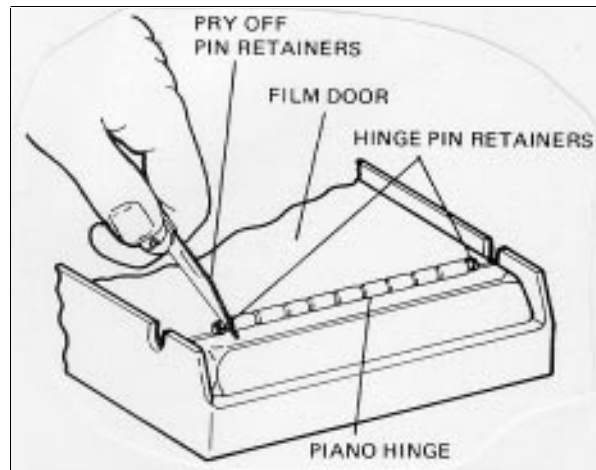


Figure 5-21. Removing Film Pack Door

J. PACK FILM HOLDER

1. Replacement of Pack Film Holder Door

a. Removal

- 1) Using a jeweler's screwdriver or other suitable tool, pry the hinge pin retainers out of each end of the hinge (figure 5-21).
- 2) Using a small drift, slide the pin out of the hinge far enough to grasp it with pliers. Pull the pin out of the hinge and remove the door.
- 3) Repair the film holder door in accordance with standard repair procedures.

b. Installation

- 1) Position the film holder door on the pack back.

- 2) Slide the hinge pin into the piano hinge until the pin has approximately 1/4 inch clearance at each end.
- 3) Position hinge pin retainers at each end of the hinge and force them in until they are fully seated.

2. Replacement of Pack Film Holder Exit Door

a. Removal

- 1) Open the film pack loading door.
- 2) Using exit door remover/insertor tool #11213, pry out friction-held door pivot pins (figure 5-22) and remove the door.

CAUTION

Use care to avoid losing the small pins.

b. Installation

- 1) Position the exit door on the film holder and insert the right hand pin, finger tight.
- 2) Insert the left hand pin, through the door return spring, with the short leg of the spring positioned to contact the inside lip of the exit door.
- 3) Insert the pin and spring into the door, finger tight.
- 4) Using tweezers, position the long leg of the spring against the inside of the exit door.
- 5) Using the exit door remover/insertor tool #11213, press the pivot pins until fully sealed.
- 6) Close the film loading door.

3. Replacement of Pack Film Holder Dark Slide Light Seal

a. Removal

- 1) Remove the dark slide.

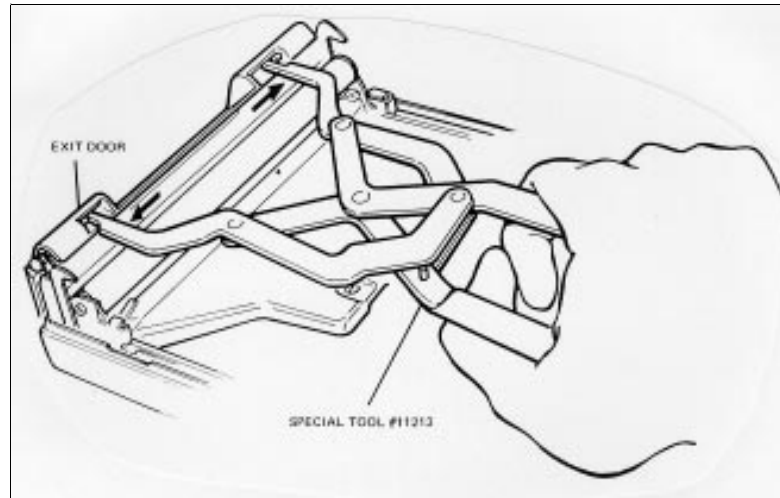


Figure 5-22. Removing Exit Door Pivot Pins

- 2) Using a Phillips screwdriver, remove the six screws securing the film holder to the film holder base.
- 3) Remove the base from the film holder.
- 4) Using a knife, lift one end of the felt seal attached to the base and peel it off.
- 5) Remove all old glue from the base.
- 6) Lift the felt and foam seals out of the film holder.

b. Installation

- 1) Position the foam seal in the film holder body.
- 2) Position the felt light seal on top of the foam seal, and tuck the flap in between the foam seal and the film holder body (figure 5-23).
- 3) Lay a thin film of glue on the film holder base and install a new felt light seal on it.
- 4) Position the base on the film holder.
- 5) Replace and tighten the six screws securing the base to the film holder.

6) Check for light leaks through the dark slide slot. If light leaks occur, repeat disassembly and reassembly, paying particular attention to the proper positioning of the foam and felt seals in the film holder body.

7) Insert the dark slide in the dark slide slot.

K. REPLACEMENT OF ROLL FILM HOLDER BASE

1. Removal

a. Remove the four screws and washers securing the base to the roll film holder.

b. Lift the base off the film holder.

NOTE

If the roll film holder requires repair, it may be repaired in accordance with standard roll film camera repair procedures.

2. Installation

a. Replace the four screws and washers securing the base to the film holder and tighten.

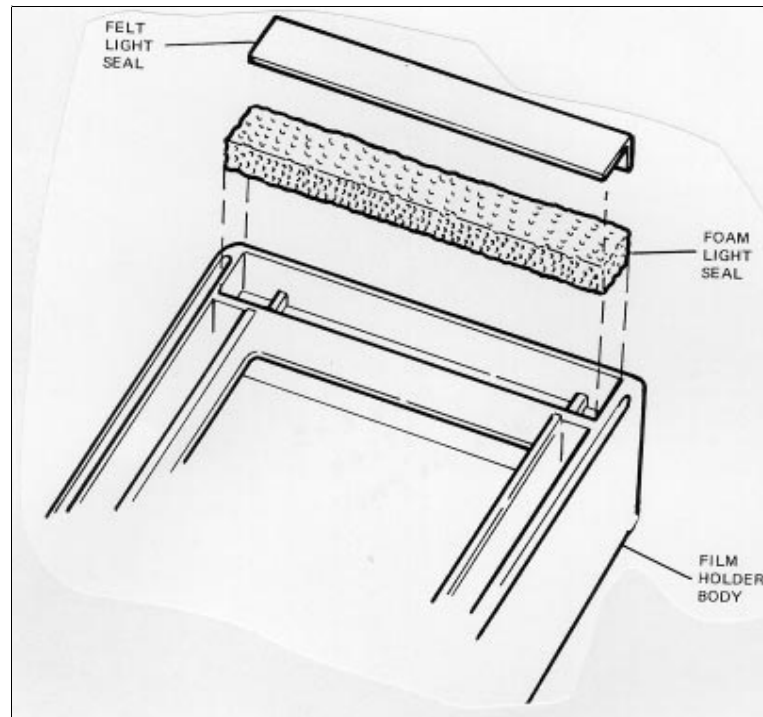


Figure 5-23. Installing the Light Seal and Foam Seal

L. REPAIR OF MP-4 LENS

1. Remove the front lens element.
2. Remove the diaphragm actuator and blades (ten blades).
3. Clean the inside of the rear lens.
4. Clean the diaphragm blades carefully with benzine. **NO SMOKING!** Do not touch the diaphragm blades with your fingers after cleaning.
5. Start laying the blades into the lens with tweezers. The ten blades are identical. Each has a rounded end and a flat end. The protrusion under the rounded end is inserted into the holes of the diaphragm support ring.
6. Insert the first six blades clockwise, one on top of the other.
7. Very carefully, move the blades toward the center of the lens. This will expose the remaining four holes in the support ring.

8. Place the next four blades into position by inserting them carefully under the blades that have been moved into the center of the lens, and placing them into the remaining four holes, still going clockwise. Be sure to maneuver the blade over the blade at its immediate left.

9. When all the blades are correctly in place, they form a continuous circle with no top starting blade visible.

10. Move the aperture selector to some number between its largest and smallest openings. There will be a definite detent at each stop, as there is a click ball that rides between the selector ring and the main housing.

11. Place the diaphragm actuator into the lens assembly, being sure to insert the prong on the actuator into the cut-out of the main assembly and selector ring.

12. Using a fine pointed tool, such as a dental pick, position the protrusions on the flat ends of the diaphragm blades into the slots of the actuator. This may require some trial and error.

13. When all the blades are trapped, move the selector ring from full open (4.5) to the smallest aperture, to be sure the blades move freely.

14. Insert the front lens and shellac it in place.